COLORADO WATER QUALITY CONTROL COMMISSION
STATE OF COLORADO

PROPONENT'S PREHEARING STATEMENT OF THE COLORADO SECTION OF THE WATEREUSE ASSOCIATION AND THE JOINT WATER REUSE COMMITTEE OF RMWEA/RMSAWWA

IN THE MATTER OF PROPOSED MODIFICATIONS TO THE RECLAIMED WATER CONTROL REGULATION, REGULATION NO. 84

March 5, 2013

I. STATEMENT OF FACTUAL AND LEGAL CLAIMS

A Proponents group consisting of the Colorado Section of the WateReuse Association (WateReuse Colorado, "WRCO") and the Joint Water Reuse Committee ("Committee") of the Rocky Mountain Water Environment Association and the Rocky Mountain Section of the American Water Works Association (RMWEA/RMSAWWA) provides this information in the form of written testimony (attached) concerning its proposal for modification to the Reclaimed Water Control Regulation, Regulation No. 84.

II. WRITTEN TESTIMONY

The Proponent group's initial proposal (as submitted to the Water Quality Control Commission in December 2012 and attached to the Notice of Public Rulemaking Hearing approved by the Commission in January 2013) is provided as Exhibit 1 to this Prehearing Statement. The Proponents submit a revised proposal herewith (Exhibit 2), reflecting minor revisions to the proposed regulatory language.

The Proponents offer written testimony in Exhibit 3 that discusses the proposed modifications to the regulation in terms of protection of public health and the environment. Exhibit 3 also includes a summary of the changes made between the Proponent's initial proposal (Exhibit 1) and revised proposal (Exhibit 2).

Further written testimony includes a report commissioned by Denver Water to further document the protection of public health and the environment associated with proposed Vehicle Washing and Commercial Laundry uses. That report is submitted herewith as Exhibit 4.

III. WITNESSES

1. John Rehring, Chair of the New Uses Subcommittee of the Water Quality Forum Regulation No. 84 Work Group, will provide testimony on the background and process for development of the proposal and the drivers for seeking changes to the existing Regulation No. 84. Mr. Rehring

may also provide testimony on the protection of public health and environment afforded by the proposed modifications.

2. Other members of the Proponents group, including Damian Higham, Frank Johns, Tara Kelley, Scott Lehman, and Jenny Murray, may provide testimony on the protection of public health and environment afforded by the proposed modifications. The Proponents reserve the right to call rebuttal witnesses as necessary.

IV. EXHIBITS

1. Proposed modifications to Regulation No. 84 and the proposed Statement of Basis, Specific Statutory Authority and Purpose, as originally submitted to the Commission in December 2012 (Attached)

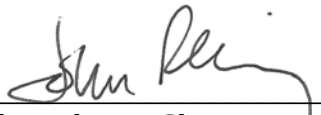
2. Revised proposed modifications to Regulation No. 84 and the proposed Statement of Basis, Specific Statutory Authority and Purpose (Attached)

3. Written Testimony Supporting Proposed Modifications to Regulation No. 84 (Attached)

4. Evaluation of Converting Vehicle Washes and Commercial Laundries to Reclaimed Water, report commissioned by Denver Water, February 2013 (Attached)

Respectfully submitted this 5th day of March 2013.

FOR THE COLORADO SECTION OF THE WATEREUSE ASSOCIATION AND THE JOINT WATER REUSE COMMITTEE OF RMWEA/RMSAWWA:



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Proponent's Exhibit 1

REGULATION NO. 84 ORIGINAL PROPOSAL

PROPONENT'S EXHIBIT 1

COLORADO DEPARTMENT OF PUBLIC HEALTH AND ENVIRONMENT
WATER QUALITY CONTROL COMMISSION

REGULATION NO. 84
RECLAIMED WATER CONTROL REGULATION

ADOPTED:	October 10, 2000
EFFECTIVE:	November 30, 2000
TRIENNIAL REVIEW:	October 8, 2003
AMENDED:	May 10, 2004
EFFECTIVE:	June 30, 2004
AMENDED:	October 11, 2005
EFFECTIVE:	November 30, 2005
AMENDED:	August 13, 2007
EFFECTIVE:	September 30, 2007

DEPARTMENT OF PUBLIC HEALTH AND ENVIRONMENT

Water Quality Control Commission

5 CCR 1002-84

RECLAIMED WATER CONTROL REGULATION

84.1 AUTHORITY

This regulation is promulgated pursuant to the Colorado Water Quality Control Act (CWQCA) section 25-8-101 through 25-8-703, C.R.S. In particular, it is promulgated under sections 25-8-202 and 25-8-205, C.R.S.

Materials incorporated by reference are available for public inspection during normal business hours, or copies may be obtained at reasonable cost, from the Administrator, Water Quality Control Commission, 4300 Cherry Creek Drive South, Denver, Colorado 80246. Unless expressly stated otherwise, materials incorporated by reference are those editions dated as referenced by date in the regulation or in existence as of the date this regulation is promulgated or revised by the Water Quality Control Commission and references do not include later amendments to or editions of the incorporated material. All material incorporated by reference may be examined at any state publications depository.

84.2 PURPOSE

The purpose of this regulation is to establish requirements, prohibitions, standards and concentration limits for the use of reclaimed water to protect public health and the environment while encouraging the use of reclaimed water.

84.3 SEVERABILITY

The provisions of this regulation are severable, and if any provisions or the application of the provisions to any circumstances is held invalid, the application of such provision to other circumstances, and the remainder of this regulation shall not be affected thereby.

84.4 APPLICABILITY

This regulation applies to the use of reclaimed water for landscape irrigation, agricultural irrigation, fire protection, industrial, and commercial uses identified in section 84.8 of this regulation. This regulation does not apply to wastewater that has been treated and released to state waters prior to subsequent use or to wastewater that has been treated and used at a domestic wastewater treatment plant site for landscape irrigation or process uses. This regulation applies to individual treaters and users, as defined below, upon the issuance of a Notice of Authorization pursuant to section 84.6(C) herein by the Water Quality Control Division.

84.5 DEFINITIONS

The following definitions shall apply:

(1) Agricultural Irrigation means use of reclaimed water for the irrigation of crops and trees, excluding crops produced for direct human consumption, range crops where dairy animals forage, and trees that produce nuts or fruit intended for human consumption.

(2) Agricultural Irrigation User means a person who uses reclaimed water for the purpose of agricultural irrigation.

~~(1)~~(3) Agronomic Rate means the rate of application of reclaimed water and associated nutrients to plants that is necessary to satisfy the plants' nutritional and watering requirements while strictly minimizing the amount of nutrients that run off to surface waters or which pass below the root zone of the plants.

~~(2) Closed Loop Cooling System means a cooling system that has negligible exposure potential to workers and, where applicable, to the public.~~

(4) Automated Vehicle Washing means the cleaning of vehicles and associated equipment, such as trailers, where automated equipment is used to apply spray water, cleaning products, and/or rinse water, where there is no public exposure to reclaimed water under normal operations and only limited and controlled contact with reclaimed water by trained workers.

(5) Commercial Laundry means a facility that uses water to clean clothing and other textile products where only laundry workers operate the washing machines and cleaning equipment, where there is no public exposure to reclaimed water under normal operations and only limited and controlled contact with reclaimed water by trained workers.

~~(3)~~(6) Commercial User means a person who uses reclaimed water in the operation of a business listed in Table A of section 84.8.

~~(4)~~(7) Division means the Water Quality Control Division of the Colorado Department of Public Health and Environment.

~~(5) Dust Control means the wetting down or pre-watering of work surfaces, work areas, and roads to minimize the off-property transport of airborne particulate matter from activities such as construction, demolition, and sandblasting.~~

(8) Evaporative Industrial Processes means the use of water in an industrial process where the benefit of such use requires the evaporation of water, requiring additional make-up water, where there is no public exposure to reclaimed water under normal operations and only limited and controlled contact with reclaimed water by trained workers.

~~(6)~~(9) Fire Protection -- Nonresidential means firefighting activities where water is made available at fire hydrants located in areas other than residential, from fire trucks, and in fire sprinkler and interior standpipe systems in buildings in commercial/industrial areas.

~~(7)~~(10) Fire Protection -- Residential means firefighting activities where water is made available at fire hydrants in residential areas, from fire trucks, and in fire sprinkler and interior standpipe systems at any structure where the occupants do not have access to the plumbing for maintenance and repair.

~~(8)~~(11) Industrial User means a person who uses reclaimed water for industrial processes or in the construction process. Approved industrial uses are listed in Table A of section 84.8.

~~(9)~~(12) Irrigation System means the facilities, piping and other equipment used by a Landscape Irrigation User or an Agricultural Irrigation User.

~~(10)~~(13) Landscape Irrigation means irrigation of areas of grass, trees, and other vegetation that are accessible to the public, including, but not limited to, parks, greenbelts, golf courses, and common areas at apartments, townhouses, commercial/business parks, and other similar complexes.

~~(11)~~(14) Landscape Irrigation User means a person who uses reclaimed water for the purpose of landscape irrigation.

(15) Manual Non-Public Vehicle Washing means the cleaning of vehicles and associated equipment, such as trailers, where any or all of the following are applied manually in the cleaning process: spray water, cleaning products, and/or rinse water; where there is no public access to the vehicle washing facility and only limited and controlled contact with reclaimed water by trained workers,

(16) Non-Discharging Construction and Road Maintenance means the use of reclaimed water for nonpotable applications where water is required for cooling, wetting, dust suppression, or other construction and road maintenance activities, where there is no public exposure to reclaimed water under normal operations and only limited and controlled contact with reclaimed water by trained workers.

(17) Non-Evaporative Industrial Processes means the use of water in an industrial process where water is not evaporated in the process and is used within a contained system, where there is no public exposure to reclaimed water under normal operations and only limited and controlled contact with reclaimed water by trained workers.

~~(12)~~(18) Person means an individual, corporation, partnership, association, state or political subdivision thereof, federal agency, state agency, municipality, commission, or interstate body.

~~(13)~~(19) Point of Compliance means a point identified by the treater in the reclaimed water treatment or transmission system after all treatment has been completed and prior to dilution and blending.

~~(14)~~(20) Reclaimed Water is domestic wastewater that has received secondary treatment by a domestic wastewater treatment works and such additional treatment as to enable the wastewater to meet the standards for approved uses.

~~(15)~~(21) Resident-Controlled Landscape Irrigation means irrigation of areas of grass, trees and other vegetation located on the property of a single family or other residential occupancy where the occupant is the User and is responsible for the maintenance and/or operation of the irrigation system.

~~(16)~~(22) Restricted Access means controlled and limited access to the areas where reclaimed water meeting Category 1 standards, as defined in section 84.7, is used.

(23) Trained Worker means a person employed at the site where reclaimed water is used, who has been provided with the information specific to the additional conditions specified in section 84.8 that are applicable to that site's approved use(s) of reclaimed water.

~~(17)~~(24) Transmission System means the treater's facilities that transport treated reclaimed water between the treater and users.

~~(18)~~(25) Treater means a person who treats and provides reclaimed water to a user for the purpose of landscape irrigation, agricultural irrigation, fire protection, commercial use or industrial use. The treater and the user may be the same entity.

~~(19)~~(26) Unrestricted Access means uncontrolled access to the areas where reclaimed water meeting the Category 2 standards, as defined in section 84.7, is used.

~~(20)~~(27) User means a person who uses reclaimed water for landscape irrigation, agricultural irrigation, fire protection, commercial or industrial uses.

~~(21)~~(28) User Plan to Comply means the information and documentation a user is required to submit to the treater under sections 84.9 of this regulation.

(29) Washwater Applications means water used in washing of miscellaneous construction/maintenance equipment, as well as concrete washout, mineral processing, and other similar uses where reclaimed water is used to remove material from equipment or a desired product, where there is no public exposure to reclaimed water under normal operations and only limited and controlled contact with reclaimed water by trained workers.

84.6 ADMINISTRATION

(A) Letters of Intent.

Treaters shall submit Letters of Intent to the Division and to the local health authority that shall include:

(1) Treater information including name of entity; legally responsible person's name, address, telephone number, and email address; and for each facility owned and/or operated by the treater where domestic wastewater is treated for transmission, the facility contact person's name, address, telephone number, and email address (if different than legally responsible person).

(2) Information demonstrating the treater's ability to comply with the applicable reclaimed water standards described in section 84.7 of this regulation, including an 8.5" x 11" or 11" x 17" schematic of the treatment process showing the location of the proposed point(s) of compliance. Include the point of compliance for demonstration that secondary treatment has been attained which may be the same or different than the point where attainment of reclaimed water standards will be demonstrated. Include either: a copy of the site application approval letter and the approval letter for the reclaimed water treatment facility plans and specifications; or evidence of submittal of a site application and plans and specifications to the Division.

(3) An analysis that demonstrates that reclaimed water used for landscape irrigation or agricultural irrigation will be applied at or below agronomic rates. Landscape irrigation and agricultural irrigation uses may also be subject to waste load allocations or limits as contained in a Total Maximum Daily Load (TMDL) or control regulation governing the watershed within which the irrigation occurs.

(4) A reuse system management plan which includes: a description of the proposed reclaimed water treatment and transmission systems; a description of the treater's program to inform and educate users on the requirements of this regulation; a description of the treater's plan to oversee the use of reclaimed water by users to ensure, to the maximum extent practicable, that users attain and maintain compliance with this regulation; and evidence of the treater's legal ability (regulation, ordinance, contract, or other acceptable mechanism) to terminate service to a user if the user fails to comply with this regulation.

(5) A certification statement as per section 84.13 of this regulation.

(6) For each user, a "User Plan to Comply" developed in cooperation with the treater and meeting the requirements of section 84.9.

(7) Affirmation that the reuse of this water by the treater will not materially injure water rights.

(8) When reclaimed water is used for fire protection, the Letter of Intent shall also include a map indicating areas where reclaimed water is to be supplied for fire protection uses and identifying the fire protection authority(s) having jurisdiction. The Letter of Intent shall also include a letter from the fire protection authority(s) having jurisdiction indicating their approval of using reclaimed water for fire protection activities.

(9) Where the land application of reclaimed water is subject to limitations on concentration and/or loading of nitrogen or phosphorus pursuant to a control regulation adopted by the Water Quality Control Commission, a statement as to whether the treater intends to have such limitations included in the Notice of Authorization issued under this regulation or under a permit issued pursuant to Regulation No. 61.

(B) Division Review. The treater shall be notified in writing not more than thirty (30) calendar days after receipt of a Letter of Intent by the Division if, and in what respects, the Letter of Intent is incomplete. Upon the written agreement of the treater, the review period may be extended for a period mutually agreed to by the treater and the Division. Where information provided by a user is incomplete, the treater may amend the Letter of Intent to address the deficiency or to remove that user from the Letter of Intent.

(C) Issuance of Notices of Authorization. The Division shall either issue or deny the Notice of Authorization within thirty (30) calendar days of its determination that the Letter of Intent is complete. Upon the written agreement of the treater, the review period may be extended for a period mutually agreed to by the treater and the Division. The treater shall be notified in writing upon denial of the Notice of Authorization of such action and the reason(s) for the denial. The Division shall issue separate Notices of Authorization to the treater and to each user. Treaters and users planning to use reclaimed water shall have or obtain a Notice of Authorization from the Division prior to any use of reclaimed water.

(D) Appeal of Issuance or Denial of Notice of Authorization. The treater or user, or any other person potentially adversely affected or aggrieved by Division issuance or denial of a Notice of Authorization, may submit a request, within thirty (30) days of the date of issuance or denial, to the Administrator of the Water Quality Control Commission ("Commission"), for a hearing.

(1) Such hearing shall be conducted pursuant to the requirements of the Procedural Regulations for all Proceedings before the Commission and the Division, Regulation No. 21, 5 CCR 1002-21.

(2) The person requesting the hearing shall have the burden of proof in all hearings held pursuant to this section.

(E) Terms and Conditions of Notices of Authorization. Notices of Authorization (NOAs) issued by the Division shall contain such terms, limitations, and conditions as are deemed necessary by the Division to ensure compliance with this regulation, except for those NOAs that contain a schedule of compliance as determined by the Division. At a minimum, all NOAs shall contain the following:

(1) Treater information including name of entity; legally responsible person's name, address, telephone number, and email address; and for each facility owned and/or operated by the treater where domestic wastewater is treated for distribution, the facility contact person's name, address, telephone number, and email address (if different than legally responsible person). For the treater NOA, a list of approved users and their associated uses shall be included;

(2) Issuance date;

(3) The approved uses as defined in Table A of section 84.8, including the category of reclaimed water and the associated numeric limit for each use from section 84.7;

(4) For User NOAs, the location(s) of use, a description of the approved use(s), and best management practices that meet the requirements of subsection 84.9(A) or (B), as applicable and 84.9(C);

(5) A requirement that the treater implement its reuse system management plan that meets the requirements of subsection 84.6(A)(4) to ensure user compliance with this regulation. For User NOAs, include a requirement that the user comply with the User Plan to Comply;

(6) Where the treater has so requested in the Letter of Intent per Section 84.6(A)(9), conditions defining limitations for concentration and loading of nitrogen and/or phosphorus pursuant to a control regulation adopted by the Water Quality Control Commission.

(7) A requirement to submit information to the Division requesting the amendment of a Letter of Intent prior to making any of the following significant changes:

(a) Adding an additional user or deleting a user;

(b) When a treater proposes any significant physical or operational changes;

(c) If reclaimed water is used for irrigation, when there is a significant change in the agronomic rate analysis; and

(d) When any user governed by an existing Notice of Authorization significantly modifies or changes its physical or operational use of reclaimed water, including, but not limited to, the addition of landscape area to be irrigated that is not contiguous to an existing approved area, addition of areas where reclaimed water is to be used for fire protection, addition of a new user or use in a new commercial or industrial process, or use in a new location.

Said request for amending the Letter of Intent shall be made at least thirty days prior to implementing a change described in subsections (a) or (c), above, and at least sixty days prior to implementing a change described by subsections (b) or (d), above.

(8) Terms for modification, revocation, or termination;

(9) Required monitoring, as is reasonably necessary, to be performed by the user;

(10) Reporting and record keeping requirements;

(11) Public access restrictions, if applicable; and

(12) A statement of applicable civil and criminal penalties.

84.7 RECLAIMED WATER CATEGORIES AND STANDARDS

(A) Category 1 Standards: Reclaimed water, for uses where Category 1 water is required, shall, at a minimum, receive secondary treatment with disinfection. The following reclaimed water standards shall apply at the point of compliance:

Parameter	Limit
E. coli/100 ml	126/100 ml monthly geometric mean and 235/100 ml single sample maximum.
Total Suspended Solids	30 mg/L as a daily maximum.

(B) Category 2 Standards: Reclaimed water, for uses where Category 2 water is required, shall, at a minimum, receive secondary treatment with filtration and disinfection. The following reclaimed water standards shall apply at the point of compliance:

Parameter	Limit
E. coli/100 ml	126/100 ml monthly geometric mean and 235/100 ml single sample maximum.
Turbidity, NTU	Not to exceed 3 NTU as a monthly average and not to exceed 5 NTU in more than 5 percent of the individual analytical results during any calendar month.

(C) Category 3 Standards: Reclaimed water for uses where Category 3 water is required shall, at a minimum, receive secondary treatment with filtration and disinfection. The following reclaimed water standards shall apply at the point of compliance:

Parameter	Limit
E. coli/100 ml	None detected in at least 75% of samples in a calendar month and 126/100 ml single sample maximum.
Turbidity, NTU	Not to exceed 3 NTU as a monthly average and not to exceed 5 NTU in more than 5 percent of the individual analytical results during any calendar month.

84.8 RECLAIMED WATER USES

Table A: Approved Uses of Reclaimed Water

Approved Uses	Category 1	Category 2	Category 3	Additional Conditions Required 84.8(A)
INDUSTRIAL				
~~Cooling Tower~~Evaporative Industrial Processes	Allowed	Allowed	Allowed	1
~~Concrete Mixing and Washout~~Washwater Applications	Not Allowed	Allowed	Allowed	2,3,7
~~Dust Control~~Non-Discharging Construction and Road Maintenance	Allowed	Allowed	Allowed	3,7
~~Soil Compaction~~	~~Allowed~~	~~Allowed~~	~~Allowed~~	~~3~~
~~Closed Loop Cooling System~~Non-Evaporative Industrial Processes	Allowed	Allowed	Allowed	7
LANDSCAPE IRRIGATION				
Restricted Access	Allowed	Allowed	Allowed	
Unrestricted Access	Not Allowed	Allowed	Allowed	3,4
Resident-Controlled	Not Allowed	Not Allowed	Allowed	3,4,5

COMMERCIAL				
~~Mechanized Street Cleaning~~	~~Allowed~~	~~Allowed~~	~~Allowed~~	~~3~~
Zoo Operations	Allowed	Allowed	Allowed	
Commercial Laundries	Not Allowed	Allowed	Allowed	7
Automated Vehicle Washing	Not Allowed	Allowed	Allowed	3,7
Manual Non-Public Vehicle Washing	Not Allowed	Allowed	Allowed	3,7
FIRE PROTECTION				
Nonresidential Fire Protection	Not Allowed	Allowed	Allowed	6
Residential Fire Protection	Not Allowed	Not Allowed	Allowed	6
AGRICULTURAL IRRIGATION				
Non-Food Crop Irrigation and Silviculture	Allowed	Allowed	Allowed	3

(A) Additional Conditions Required. In addition to the conditions for use of reclaimed water listed in section 84.9, the Division will include the following best management practices in the Notices of Authorization for the associated uses listed in Table A:

(1) If there is a significant likelihood for aerosols to drift to public or worker areas, adequate signage is required. Consider supplemental disinfection and ~~chlorine~~disinfectant residual and/or public access restrictions.

(2) ~~Category 1 water is allowed in the mixing process only; washing off trucks and using as truck supply water is prohibited. Category 2 water may be used for mixing, washing and truck supply water as long as the user complies with the requirements set forth in section 84.9 of this regulation. Mixing and w~~Washing activities must be contained (e.g., flow to lined pit or approved concrete washout area, or within enclosed equipment), as to prevent any off-site runoff or discharge to ground water. ~~Truck drivers and workers~~Workers shall be trained on the proper use and ~~washout~~washing procedures when using reclaimed water.

(3) Application rates or other measures shall be employed to minimize ponding on or runoff from the area approved for application or use.

(4) No reclaimed water piping shall be extended to or supported from any residential structure and there shall be no accessible above grade outlets from the reclaimed water system at any residential structure. At least one exterior hose bib, supplied with potable water, shall be provided at each residential structure.

(5) The treater shall develop and implement a public education program to inform residents and plumbing contractors and inspectors who deal with the Resident-Controlled Landscape Irrigation systems about the need to: a) strictly prohibit cross-connections between the reclaimed water and potable water systems; b) clearly and distinctively identify the potable service lines and plumbing from the reclaimed water service lines and plumbing; and c) avoid contact with and strictly minimize ponding or runoff of the reclaimed water. The treater shall implement a cross-connection inspection program and shall have the authority to discontinue reclaimed water service to any resident who flagrantly or repeatedly misuses reclaimed water in a manner inconsistent with this regulation. The treater shall maintain a map indicating all areas where reclaimed water is provided for Resident-Controlled Landscape Irrigation.

(6) The user shall develop and implement a program, including notices in fire department newsletters and fire department preplans, to educate the public and firefighters that

reclaimed water is used for fire protection. The user shall develop a program to educate plumbing and fire protection system contractors and inspectors expected to access the fire protection system about the need to confirm that cross-connections between the reclaimed water and potable water systems do not exist and about the requirement to clearly identify the potable and reclaimed water systems throughout the building. All personnel authorized to use the reclaimed water for fire protection shall be educated to avoid contact with and strictly minimize ponding or runoff of the reclaimed water during non-emergency testing or training. An annual cross-connection inspection shall be made at each structure to which reclaimed water piping is extended for fire protection to ensure that no cross-connection exists. The treater shall maintain a map indicating the location of all fire hydrants, sprinkler systems and standpipe systems provided with reclaimed water.

(7) Users of Category 1 Reclaimed Water (if allowed for the use per Table A) or Category 2 Reclaimed Water shall employ measures to prevent the frequent exposure of workers and the public to aerosols generated in the use of reclaimed water. Measures shall include at least one of the following: minimum setback distance of 100 feet between the nearest source of aerosol generation and areas where workers or the public are normally present; physical barriers between aerosol sources and humans; personal protective equipment to prevent aerosol inhalation; functionally equivalent measures approved by a qualified individual (e.g., a certified industrial hygienist); or other means approved by the Division. Given the higher level of treatment provided for Category 3 Reclaimed Water, additional measures to address exposure of workers or the public to aerosols are not required.

84.9 CONDITIONS FOR USE OF RECLAIMED WATER

(A) Landscape Irrigation Users and Agricultural Irrigation Users shall include the following in a User Plan to Comply:

(1) User information including name of entity; legally responsible person's name; address; telephone number; email address; and site address where reuse water will be used;

(2) An 8.5" x 11" or an 11" x 17" map or schematic drawing indicating the specific area(s) where irrigation with reclaimed water will take place;

(3) A description of the best management practices the user intends to implement to ensure that direct and windblown spray and other means of human exposure from irrigation systems will be confined to the areas designated and approved in the Notice of Authorization;

(4) Best management practices the user intends to employ to ensure that application rates shall be controlled to strictly minimize ponding and runoff and to minimize the amount of applied water and associated pollutants that pass through the root zone of the plants to be irrigated (e.g., rain shutoff devices, application at evapotranspiration rates adjusted for irrigation efficiency, daily inspections, or other means); and

(5) If applicable, information demonstrating how the user will restrict access to landscaped areas where Category 1 reclaimed water is to be applied either by:

a) Irrigating only during periods approved in the Notice of Authorization so as to strictly minimize public contact with reclaimed water, or

b) Installing barriers to prevent public access to the site, as approved in the Notice of Authorization, restricting irrigation to times when the barriers are in place, and

ceasing irrigation at least one hour prior to the barriers being totally or partially removed.

(6) For Resident-Controlled Landscape Irrigation, unless a homeowners' association or other entity acceptable to the Division assumes responsibility, the treater shall be responsible for all information required in the User Plan to Comply and shall act as the users' legal representative for purposes of certification pursuant to section 84.9(D) below.

(B) Commercial, industrial, and fire protection Users shall include the following in a User Plan to Comply:

(1) User information including name of entity; legally responsible person's name; address; telephone number; email address; and site address where reuse water will be used;

(2) A description of how reclaimed water is to be used;

(3) An 8.5" x 11" or 11" x 17' map or schematic showing where such use will occur;

(4) The potential for public contact with reclaimed water used in the commercial or industrial operation(s) or process(es);

(5) The fate of waste water streams from the commercial or industrial operation or process after use (e.g., discharge to sanitary sewer, lined evaporation/recovery pond, subsequent permitted discharge, or other location);

(6) Best management practices the user intends to implement to prevent or minimize direct and windblown spray and other pathways of human exposure to reclaimed water;

(7) If applicable, information demonstrating how the user will restrict access to commercial or industrial areas, operations or processes where Category 1 reclaimed water is to be used; and

(8) Where reclaimed water is used to supply a fire sprinkler or standpipe system, information describing the user's cross-connection control, prevention and identification program that the user will implement to prevent any cross-connection between the reclaimed water and potable water systems.

(C) All users shall include information in their User Plan to Comply that demonstrates compliance with the following:

(1) Use of reclaimed water shall be confined to the authorized use area, operation, or process.

(2) Precautions shall be taken to ensure that reclaimed water will not be sprayed on any facility or area not designated for application such as occupied buildings, domestic drinking water facilities, or facilities where food is being prepared for human consumption.

(3) Notification shall be provided to inform the public that reclaimed water is being used and is not safe for drinking. The notification shall include posting of signs of sufficient size to be clearly read in all use areas, around impoundments, and on tanks, tank trucks and other equipment used for storage or distribution of reclaimed water, with appropriate wording in the dominant language(s) expected to be spoken at the site.

(4) All new, modified, or replaced piping, valves, controllers, outlets, and other appurtenances, including irrigation systems and any equipment used for fire protection or

in a commercial or industrial operation or process, shall be marked to differentiate reclaimed water from potable water or other piping systems.

(5) An approved backflow prevention device or cross-connection control method shall be provided at all potable water service connections to reclaimed water use areas.

(6) Operation of the irrigation system, including valves, outlets, couplers, and sprinkler heads, and commercial or industrial facilities and equipment utilizing reclaimed water, shall be performed only by personnel authorized by the user and trained in accordance with subsection 84.9(C)(10).

(7) Supplementing reclaimed water with potable water by a user shall not be allowed except through an approved reduced pressure principle backflow prevention device or an air gap. Where a backflow prevention device is used it must be tested on an annual basis by a Certified Cross-Connection Control Technician, unless there is a physical separation (e.g., removal of the connecting pipe, etc.) between the potable and reuse distribution systems.

(8) Supplementing reclaimed water with water from irrigation wells or industrial wells shall not be allowed except through an approved reduced pressure principle backflow prevention device or an air gap.

(9) There shall be no impoundment or irrigation of reclaimed water within 100 feet of any well used for domestic supply unless:

(a) In the case of an impoundment, the impoundment is lined with a synthetic material with a permeability of 10^{-6} cm/sec or less; or

(b) In the case of irrigation, other precautions are implemented and included as a condition of the Notice of Authorization, to prevent contamination of the well.

(10) Workers shall be informed of the potential health hazards involved with contact or ingestion of reclaimed water and shall be educated regarding proper hygienic procedures to protect themselves.

(11) The additional conditions included in section 84.8, as applicable.

(D) Each User Plan to Comply shall include a statement signed by the user, or a legal representative of the user, that certifies:

(1) The user has been provided a copy of this regulation and agrees to comply with the applicable requirements of this regulation, in particular the Conditions for Use of Reclaimed Water described in sections 84.8 and 84.9, and, if applicable, the access restrictions when Category 1 reclaimed water is used. The user shall submit a certification statement per section 84.13 of this regulation with the information provided in this item; and

(2) The user agrees to allow the treater or the Division reasonable access to the site to determine whether the user is in compliance with this regulation, and/or to perform monitoring and analysis as may be required in section 84.10.

84.10 MONITORING, RECORD KEEPING AND REPORTING

(A) Treaters and users operating pursuant to a Notice of Authorization shall be subject to such monitoring, record keeping, and reporting requirements as may be reasonably required by the

Division to ensure compliance with the requirements of this regulation, including, but not limited to the following:

(1) For treaters: the quality of reclaimed water produced and delivered at the point(s) of compliance, inspections of a representative number and type of user sites to determine user compliance, and self-certifications submitted to the treater by users.

(2) For each user, the total volume of reclaimed water used per year. For Landscape Irrigation Users and Agricultural Irrigation Users, each location with the associated acreage where reclaimed water was applied.

(3) For each user using Category 1 reclaimed water, confirmation that reclaimed water was used only during authorized use times (if applicable).

(B) Treaters shall provide an annual report to the Division for the previous year, by ~~January~~March 31st, that includes the following:

(1) Information demonstrating the treater's compliance with the reclaimed water standards, including applicable treatment requirements described in section 84.7 of this regulation.

(2) Confirmation that the treater conducted inspections pursuant to section 84.10(A)(1) above.

(3) Violations of this regulation by users pursuant to section 84.10(C)(1), below.

(4) A certification statement by the treater as per section 84.13 below regarding the information provided by the treater in subsections (1) and (2) above.

(5) Information supplied by users to the treater demonstrating compliance with the conditions applicable to each specific user included in the Notice of Authorization.

(6) Certification statements from each user as per section 84.13 below regarding the information provided in subsection (5) above.

(C) The treater and users shall report any violations as follows:

(1) Violations of this regulation and/or Notices of Authorization at their respective facilities in writing to the Division, within thirty days of becoming aware of the violation. Where the treater finds violations by a user, the thirty day period for reporting is waived for a period of up to thirty additional days, if the treater is working with the user to resolve the violation. If the violation is resolved, no separate notice to the Division is required except that the violation is to be reported in the treater's annual report. If the violation is continuing after a total of sixty days from the time the treater became aware of the violation, the treater shall report the violation to the Division within five working days. Nothing in this section precludes a user from reporting violations by a treater to the Division.

(2) For more serious violations (including non-permitted discharges to surface waters, uncontrolled cross-connections, exceedences of the reclaimed water standards for *E. coli*, or other violations posing an immediate threat to public health or the environment): orally to the Division within 24 hours of becoming aware of the violation, followed up by a written report within five working days. The written report shall contain a description of the noncompliance, including exact dates and times; and steps taken or planned to reduce, eliminate, and prevent recurrence of the noncompliance.

84.11 VARIANCES

The Division may grant a variance from any provision of this regulation, except that with respect to the *E.coli* standards in section 84.7, a variance may only be granted from the "235/100 ml single sample maximum" standard. The Division may grant a variance in a particular case where the treater or the user demonstrates that the benefits to public health or the environment that will be created by compliance with the subject provision do not bear a reasonable relationship to the costs required to achieve compliance.

84.12 ENFORCEMENT

Violations of this regulation by treaters and users shall be subject to enforcement by the Division pursuant to Part 6 of the CWQCA. A treater shall not be subject to enforcement for a violation by a user; a user shall be solely responsible for its compliance with the terms and conditions imposed upon users. However, if the treater was aware of a violation by a user and did not report it as required in subsection 84.10(C), the treater may be subject to an enforcement action for failure to report the violation. A user shall not be subject to enforcement for a violation by a treater; a treater shall be solely responsible for its compliance with the terms and conditions imposed upon treaters. However, if a user was aware of the violation and did not report it as required in subsection 84.10(C), the user may be subject to an enforcement action for failure to report the violation.

84.13 CERTIFICATION

Persons who are required to make submittals pursuant to subsections 84.6(A)(5), 84.9(D), and 84.10(B) of this regulation, shall include the following certification statement:

"I certify, under penalty of law, that the information I am providing in this submittal is true, accurate, and correct. This determination has been made under my direction and supervision in accordance with a system designed to ensure that qualified personnel properly gather and evaluate the information. I am aware that there are significant penalties for false certification including the possibility of fine and imprisonment."

84.14 - 84.20 Reserved

84.21 STATEMENT OF BASIS, SPECIFIC STATUTORY AUTHORITY, AND PURPOSE

The provisions of sections 25-8-205(1) and 25-8-308(1)(h) C.R.S., provide the specific statutory authority for the Reclaimed Domestic Wastewater Reuse Control Regulation adopted by the Commission. The Commission has also adopted, in compliance with section 24-4-203(4), C.R.S., the following statement of basis, specific statutory authority, and purpose.

BASIS AND PURPOSE

A. Background

In March of 1998 the Commission requested that a subcommittee of the Water Quality Forum be convened to consider potential statutory changes to the Colorado Water Quality Control Act ("Act") to address reuse of reclaimed domestic wastewater for landscape irrigation. The joint reuse committee of the American Waterworks Association and the Water Environment Association ("AWWA/WEA") suggested this approach to the Commission in a February 1998 presentation.

In the fall of 1999 the Forum subcommittee made a recommendation that the Colorado Water Quality Control Act be amended to provide the Commission with the authority to promulgate control regulations for the oversight of reuse and to provide the Division with the authority to implement a reuse program. In March of 2000 the general assembly adopted changes to the Act consistent with the subcommittee's recommendations and those changes became effective on July 1, 2000. The subcommittee had been

concurrently working on a proposed control regulation that is patterned after the Commission's Biosolids Regulation.

B. Regulatory System Overview

It is the intent of the Commission that this regulation further promote reuse of reclaimed domestic wastewater by providing a comprehensive framework which, when followed, will assure responsible management of operations and a product of a quality compatible with the state's goals of protecting the public health and the environment. The Commission concludes that the provisions of this regulation are economically reasonable considering the economic, environmental and public health costs and impacts of the program.

The Commission, in adopting these regulatory provisions, has limited the scope of the regulation to reuse of reclaimed domestic wastewater for landscape irrigation. The statutory changes do not, on their face, appear to limit the adoption of control regulations to this type of reuse. However, the Commission finds that it is appropriate to limit the scope of the regulation to this aspect of reuse based on the AWWA/WEA recommendation that landscape irrigation should be addressed first as the vast majority of reclaimed domestic wastewater in Colorado is used for this purpose. The Commission will consider regulatory proposals for other types of reuse, such as industrial and agricultural, in future rulemaking hearings where recommendations from a broad spectrum of interests are brought forward. This regulation is not intended for single family residential areas, unless the landscape irrigation areas are commonly owned or otherwise subject to reasonable controls by a neighborhood association to assure application is consistent with the "Conditions for Application" requirements.

The Commission has adopted provisions for the application of reclaimed domestic wastewater at "agronomic rates" with the intent that, once conforming changes are made to the Colorado Discharge Permit System ("CDPS") Regulations, reuse of reclaimed domestic wastewater in accordance with the provisions of this regulation will not be required to obtain a CDPS ground water discharge permit. The Commission does not intend that these regulations be used to limit flexibility to apply additional nutrients to landscaping being irrigated with reclaimed domestic wastewater. The Commission does expect that treaters will, as part of their overall program, inform applicators of the nutrient content of the reclaimed domestic wastewater.

The Commission has found that the use of an approach similar to that defined in the Biosolids Regulation will provide the appropriate level of oversight of reuse operations yet will not unduly burden the entities that are treating and applying reclaimed domestic wastewater to landscape.

The Commission expects that the amount of available information both on the health effects of reclaimed domestic wastewater and on the monitoring of pathogens will increase over the next several years. As a result, the Commission anticipates that the standards may be adjusted as new information becomes available. In the triennial review of this regulation, the Commission will consider any new information that is brought to it concerning pathogenic microorganisms and indicators of the presence or absence of such microorganisms in reclaimed domestic wastewater.

C. Letters of Intent

In order to facilitate the use of reclaimed domestic wastewater the "treater" is required to submit a Letter of Intent for each "applicator" to which it will be supplying reclaimed domestic wastewater. This will add a marginal burden to the treater, the entity that is most knowledgeable of the operational and regulatory requirements of the regulation, and will facilitate the responsible use of reclaimed domestic wastewater by entities that are interested in obtaining a viable product. At the same time, the Commission recognizes that the applicator must take responsibility for the proper use of reclaimed domestic wastewater by requiring the applicator to acknowledge receipt of the regulation and their intent to comply therewith. The treater must submit a description of an educational program that, in combination with a proposed plan to oversee the applicator's operation, will provide reasonable assurance of compliance.

The Commission has allowed existing treatment and land application facilities until December 31, 2001, to submit Letters of Intent as they will continue to be regulated under an existing discharge permit. This will give these systems ample time to obtain the required information from their applicators and to develop any additional information on their own facilities. New operations are required to submit Letters of Intent at least 30 days prior to the use of reclaimed domestic wastewater for landscape irrigation. This difference in timing is appropriate as existing facilities have been operating under a different set of regulatory requirements while new operators will be made aware of the requirements of these regulations through the site application approval process for domestic wastewater treatment works.

The Commission has established a 30-day period during which the Division must notify the applicant if the Letter of Intent is incomplete. This period is long enough to allow the Division to complete its review of the application and will not unreasonably delay approval of new systems or the addition of new applicators to existing systems.

D. Notices of Authorization

The Division has an additional 30 days from the time that the Letter of Intent is determined to be complete to issue the Notice of Authorization. This Commission finds this to be reasonable amount of time as the treater will have already received approval of the site application for the treatment facilities such that a substantial amount of information regarding the system will have already been provided to the Division. The Commission has required a Notice of Authorization to be issued to the treater and each applicator as a means of ensuring that the burden of compliance with the regulations is fairly distributed between the entity providing the reclaimed domestic wastewater and the entity that is putting that water to use.

The Commission has provided the opportunity for the treater, an applicator, or any other aggrieved party to appeal the Division's decision to issue or deny a Notice of Authorization in accordance with the Commission's procedural regulations.

The Commission has not limited the effective period of the Notice of Authorization since changes other than the addition or removal of applicators are expected to be relatively infrequent. This will reduce the burden that renewing Notices of Authorization would have on both the treater/applicator and the Division.

Notices of Authorization will include appropriate monitoring and reporting requirements, reclaimed domestic wastewater standards, and other necessary conditions to ensure the protection of the environment and public health.

E. Reclaimed Domestic Wastewater Standards

Treatment Requirements and Technology-Based Limits

The public health risk of contracting disease from pathogenic microorganisms via exposure to reclaimed domestic water is mitigated by treating wastewater so as to minimize the number of viable pathogenic microorganisms: bacteria, viruses and protozoans. Acceptable public health risk is determined based on an absence of acute gastrointestinal disorders [the most likely type of disease manifestation] in those persons casually exposed to reclaimed domestic wastewater as it is used for surface irrigation of landscaping. Bacterial protection is ensured through the imposition of limits on E.coli, a surrogate organism for determining the potential presence of bacterial pathogens. Viral and protozoan (meaning specifically enteroviruses, and giardia/cryptosporidia parasites) protection is ensured by the imposition of limits for turbidity or total suspended solids, as appropriate.

The Commission has determined that, for unrestricted use of reclaimed domestic wastewater, which has a higher level of public contact, an additional barrier is appropriate to ensure the physical removal of pathogenic organisms that may potentially be present in the wastewater. Therefore, filtration, with associated turbidity limits to ensure the proper operation of the filtration facilities, is required for treaters practicing unrestricted use. Dilution after the filtration process will not provide a positive barrier to

pathogenic organisms and is not allowed to be used as a means of complying with limits unless a variance has been obtained. Restricted use, with its much lower potential for public contact, will not require filtration; however, total suspended solids limits consistent with a well-operated secondary treatment system will be required.

Selection of turbidity as a surrogate measure of microbial purity for reclaimed domestic water is valid as an inexpensive means of determining microbial purity with regard to viruses and parasites. There is an absence of data to absolutely define a turbidity at or below which viruses will be absent. Actual turbidity vis-a-vis virus density data illustrate that, when combined with adequate disinfection, an absence of virus plaque forming units can be achieved up to turbidity levels of six NTU (nephelometric turbidity units). (D'Angelo, et al. Pilot Testing to Evaluate Virus Removal and Deactivation, Proceedings of the 1984 Specialty Conference on Environmental Engineering, ASCE/Los Angeles, California, June 25-27, 1984). Similarly, from 1984 to 1991, comprehensive virus testing by Dr. Gerba at the University of Arizona recovered only one plaque forming unit (virus) from the Tucson Water Department's recycled water facility which was operating with a five NTU limit with an actual turbidity averaging between 3.5 and 4.0 NTU. In addition, there are four turbidity levels used among several states that permit the use of reclaimed domestic wastewater for irrigation. A two NTU limit is used in California, Missouri, and Oregon, a three NTU limit is used in Nevada and Texas (30-day average in TX, only), and a five NTU limit is used in Tucson, Arizona. In some cases concomitant virus and parasite (specifically Ascaris lumbricoides) monitoring is required; in other cases virus or parasite monitoring is required with no attention paid to turbidity; and in one case total suspended solids limits are used instead of turbidity limits. There is no consensus among the several states as to the appropriate turbidity limit. Accordingly, the Commission has selected a middle ground for unrestricted use application of reclaimed domestic wastewater. For these systems, calendar-month-average and maximum limits will be set at three NTU and five NTU (not to be exceeded in more than 5% of samples), respectively. No turbidity limits are required for restricted use sites, however, a total suspended solids limit of 30 mg/l is required as a daily maximum. This is deemed a somewhat conservative health risk-based standard given the low potential for contact with reclaimed domestic wastewater in this circumstance. This standard is technologically achievable and the Commission finds it to be appropriate to maintain public confidence in reclaimed domestic wastewater.

Indicator Organism and Limits

The Commission finds that E.coli is the appropriate surrogate indicator organism for determining the potential presence of bacterial pathogens in reclaimed domestic wastewater. The use of E. coli is appropriate primarily based on contemporary research presented in EPA documents summarizing the scientific studies. The most recent scientific data is contained in EPA 440/5-84-002 (Ambient Water Quality Criteria for Bacteria – 1986), and Dufour's USEPA study (Dufour, A.P., 1984, Health effects criteria for fresh recreational waters: EPA 600/1-84-004). The evidence demonstrates that E.coli is the best possible indicator organism because the ratio between pathogens of fecal origin to indicator organisms is most valid for E.coli. Furthermore, E.coli does not regrow once it is released into the ambient environment, where it only survives for about 110 hours.

This is similar to pathogen survival. These criteria do not hold for the traditional indicator organisms such as total and fecal coliforms. (Cabelli, V.J., 1982, Microbial Indicator Systems for Assessing Water Quality, Antonie van Leeuwenhoek, 48:613). In August 1998 US EPA's Office of Science and Technology, on the advice of 14 experts, strongly agreed that E.coli was the only appropriate indicator of fecal contamination.

E. coli also more closely meets and fulfills the traditional and long standing requirements of a surrogate indicator organism for pathogens. These criteria are that an indicator must be a biotype that is prevalent in sewage and excreted by humans and warm blooded animals. It should be present in greater abundance than pathogenic bacteria and the indicator should not be readily capable of proliferation. Ideally the indicator will be more resistant to disinfectants than pathogenic bacteria but will otherwise have a similar ambient survival time with them; and, the indicator should be quantifiable by simple, inexpensive, and rapid laboratory procedures. (Kott, Y., Current Concepts of Indicator Bacteria, BACTERIAL INDICATORS/HEALTH HAZARDS ASSOCIATED WITH WATER, ASTM STP 635, A. W. Hoadley and B. J. Dutka, Eds. American Society for Testing and Materials, 1977, pp 3-13.) E. coli

satisfies more of these than any other indicator microorganism recommended by health professionals for fresh water.

There are few epidemiological studies that evaluate the risk of contact with reclaimed domestic wastewater. The Commission has set the limits for E. coli at a level equivalent to that recommended by EPA for swimming beaches in Ambient Water Quality Criteria for Bacteria – 1996 which recently was reaffirmed by EPA in Draft Implementation Guidance for Ambient Water Quality Criteria for Bacteria 1996 (January 2000). While these uses do not directly correlate, the Commission has found this to be an acceptable level of risk particularly when considering that, in establishing the limit for swim beaches, it was assumed that 100 ml of water was ingested. It is reasonable to expect that criteria established to protect swimmers will be more protective of individuals casually exposed to irrigation spray of reclaimed domestic wastewater.

F. Additional Conditions

The Commission is establishing a number of conditions for the application of reclaimed domestic wastewater that are intended to provide additional assurance that the health of the public will be protected by minimizing exposure to pathogenic organisms and that runoff from reuse sites will not leave the application site or enter state waters in appreciable amounts. In response to concerns raised regarding how the restricted use conditions of the regulation may be applied to use of reclaimed domestic wastewater for irrigation of golf courses, the Commission anticipates that golf course irrigation that occurs before and after normal operating hours on golf courses that restrict public access during such times will typically satisfy the requirements of subsection 84.8(A) of the regulation.

G. Monitoring and Reporting

The Commission finds that compliance oversight of the applicators should be shared by both the Division and the treater. The treater, based on its relationship with the applicator, is in a better position to oversee the operations of the applicator and can generally resolve violations without Division intervention as part of their routine program activities. If these efforts fail to return the applicator to compliance, then the Division will assume the lead role in the compliance oversight efforts.

Due to the limited part of the year during which irrigation takes place, the Commission finds that it is appropriate to limit the submittal of reported information to an annual report. The annual report must include the confirmation that the treater conducted inspections at a representative number of applicator sites as part of the treater's overall compliance assurance program.

H. Variances

The Commission is establishing a provision for variances from any aspect of the regulation but notes that the burden is on the treater to demonstrate that compliance with the regulations is unreasonable in light of the costs to comply.

The Commission recognizes that several reclaimed domestic wastewater systems were constructed and operated prior to the adoption of this regulation. This regulation is not intended to force existing systems to make capital improvements solely for assuring standardization if they accomplish the objectives of this regulation.

PARTIES TO THE RULEMAKING HEARING

1. Spring Valley Sanitation District
2. The City of Thornton
3. The City and County of Denver, Board of Water Commissioners
4. The City of Westminster
5. Roxborough Park Metropolitan District

6. Plum Creek Wastewater Authority
7. The City of Broomfield
8. The Farmers Reservoir and Irrigation Company
9. Colorado Water Conservation District
10. Colorado Springs Utilities
11. The Town of Hotchkiss
12. Spring Valley Development, Inc.
13. The City of Aurora
14. Chatfield Watershed Authority
15. The City of Blackhawk
16. Public Service Company of Colorado

84.22 STATEMENT OF BASIS, SPECIFIC STATUTORY AUTHORITY, AND PURPOSE (April 2004 Hearing)

The provisions of sections 25-8-205(1) and 25-8-308(1)(h) C.R.S. provide the specific statutory authority for adoption of amendments to the Reclaimed Domestic Wastewater Reuse Control Regulation. The Commission also adopted, in compliance with section 24-4-203(4), C.R.S., the following statement of basis and purpose.

Basis and Purpose

When the Commission adopted Regulation 84 in October 2000, it limited its scope to use of reclaimed domestic wastewater for landscape irrigation. On October 8, 2003, the Water Quality Control Division and the Joint Water Reuse Committee of the Rocky Mountain Section American Water Works Association and Rocky Mountain Water Environment Association ("RMSAWWA/RMWEA") requested that the Commission review Regulation 84 for the purpose of considering industrial and commercial uses of reclaimed domestic wastewater. On April 12, 2004, the Commission held a rulemaking hearing during which several modifications and additions to the regulation were adopted. The Commission modified section 84.4 of the regulation to clarify that reuse of reclaimed wastewater for the uses identified in section 84.8 of the regulation is prohibited except where authorized pursuant to a Notice of Authorization. This change was made to clarify the Commission's intent that regulation 84 does not preclude the Division from authorizing uses of reclaimed wastewater that fall outside of the current scope of Regulation 84, where the Division is legally authorized to do so.

As a result of this rulemaking, the Commission amended Regulation 84 to further promote the use of reclaimed domestic wastewater, by allowing such water to be used in industrial and commercial applications as well as landscape irrigation. The Commission finds that the industrial and commercial uses contemplated by these amendments will create no greater risk to public health or the environment than the landscape irrigation uses authorized before the amendments.

The regulation, as amended, provides a framework that assures these additional uses are consistent with the Commission's goals of protecting the public health and the environment, by requiring reclaimed domestic wastewater to meet minimum standards, and requiring treaters and users of such water to employ appropriate best management practices and oversee its use.

The Commission adopted provisions requiring treaters to provide the Division with a "User Plan to Comply" for each user, prior to receiving authorization to provide reclaimed domestic wastewater. The plan shall describe the intended use and the best management practices the user will employ, and demonstrate how these practices ensure the proposed landscape irrigation, industrial or commercial use will be protective of public health and the environment.

The Commission also revised the regulation for clarity by renumbering sections, revising language, and reorganizing the regulation.

The Commission concludes that the amendments to this regulation are economically reasonable considering the economic, environmental, and public health costs and impacts of the reuse program.

Section 84.2 was modified to clarify the Commission's intent that the regulations protect the environment as well as public health. Section 84.4 was revised to expand Regulation 84's applicability for reclaimed domestic wastewater and to remove obsolete references. Section 84.4 was also revised to replace the term "direct reuse" with "reuse," as the exceptions provisions in section 84.4 already exempt waters discharged to state waters from coverage under Regulation 84. Language was also added to section 84.4 to clarify that treaters and landscape irrigation users who are operating under already existing Notices of Authorization do not need to resubmit Letters of Intent upon promulgation of these regulatory amendments. The Division will issue amended Notices of Authorization to the existing treaters and landscape irrigation users as routine amendments are made to their user information and Letters of Intent, or by June 30, 2006, whichever comes first. However, treaters and users who had implemented programs for use of reclaimed water prior to the effective date of the regulation for any use other than landscape irrigation must submit new Letters of Intent for such use(s) to the Division no later than August 31, 2004.

The Commission adopted amendments adding, deleting, and modifying definitions used in Regulation 84. The following definitions were modified or deleted to increase clarity or to achieve consistency with other revisions: "Point of Compliance," "Reclaimed Domestic Wastewater," "Restricted Use," and "Treater." The definition of "Direct Reuse" was deleted consistent with the change to section 84.4 noted above. The definition for "Applicator" was deleted and replaced with a more generic definition of "User" to include all types of users of reclaimed domestic wastewater. The following definitions were added: "Commercial User" describes a new type of user; "Industrial User" describes a new type of user; "Irrigation System" reduces confusion by differentiating between a user's irrigation system and a treater's treatment and transmission facilities; "Landscape Irrigation User" aids in differentiating between types of users; "Restricted Access" is used in place of "restricted use" for clarity; "Transmission System" reduces confusion by differentiating between a treater's facilities and a user's irrigation system; "Unrestricted Access" is used in place of "Unrestricted Use" for clarity; "User" describes the characteristics of users; and "User Plan to Comply" refers to the plan a user is required to submit to show compliance with Regulation 84.

The Commission reorganized and edited section 84.6(a) [formerly 84.5(A)] regarding letters of intent, for clarity, completeness, and consistency with other revisions. Treaters must still submit a Letter of Intent to the Division, but the Letter of Intent requirements differ, depending on the intended uses for the reclaimed domestic wastewater. In addition, the Commission recognizes that to facilitate new or expanded uses for reclaimed domestic wastewater and timely approval of projects, the Division must have some flexibility in administering the Letter of Intent process. For instance, the revisions would allow a treater to submit a Letter of Intent concurrently with a pending site application and/or facility plans and specifications.

The Commission amended subsection 84.6(A)(3) [formerly 84.5(A)(3)], to clarify that treaters are required to provide information demonstrating that reclaimed domestic wastewater applied to landscapes by landscape irrigation users will be applied at or below agronomic rates or, where application at agronomic rates is not or will not be achieved, that land application is being done pursuant to a CDPS permit. The Commission is aware that some entities may have been land applying in excess of agronomic rates, and that they have incorporated the return rates to ground water into their discharge permits and into augmentation plans. The Commission adopted this change to provide flexibility to entities practicing landscape irrigation so that they can maintain their current application practice, and associated credits under their augmentation plan, while applying reclaimed water in excess of agronomic rates pursuant to a CDPS permit. The Commission added language indicating that land application may also be subject to waste load allocations or limits as contained in a TMDL or control regulation governing the watershed within which the land application occurs, to clarify that Regulation 84 acts in tandem with these regulatory requirements. The agronomic application rate requirement does not apply to commercial and industrial users.

The Commission reorganized subsection 84.6(A)(6) [formerly 84.5(A)(6)] by moving existing requirements for users into modified sections 84.9 and 84.10, which contain the required content of a "User Plan to Comply" for each different type of use. The purpose of the User Plan to Comply is to provide the Division with information from each user that demonstrates that the proposed landscape irrigation, industrial or commercial use will be protective of public health and the environment.

The Commission amended subsection 84.6(A)(7) [formerly 84.5(A)(7)] to simplify the Letter of Intent process while, at the same time, fulfilling the Commission's responsibility under C.R.S. 25-8-104 to determine if any decision it makes has the potential to cause material injury to water rights.

The Commission moved the requirement that a treater must update and modify its Letter of Intent under certain circumstances to subsection 84.6(E)(7) [formerly 84.5(A)(8)] under Terms and Conditions of Notices of Authorization. The Commission inserted a requirement for the treater to include a letter from the fire protection authority indicating its approval for use of reclaimed domestic wastewater for fire protection activities. This requirement assures that the fire protection authority has been solicited. This section 84.6(E) [formerly 84.5(E)] regarding Notices of Authorizations was revised for clarity, completeness, and consistency with other revisions.

In this rulemaking, the Commission established category-based standards for reclaimed domestic wastewater quality in section 84.7 [formerly 84.6]. Category 1 standards apply to water previously designated for "restricted use," and Category 2 standards apply to water previously designated for "unrestricted use." The category framework allows the Commission to identify with more precision the appropriate uses for various qualities of reclaimed domestic wastewaters, while the terms "restricted use" and "unrestricted use" were found to be incompatible with the diverse industrial and commercial settings where reclaimed domestic wastewater is now authorized to be used. The category-based framework also will facilitate the Commission's future review of proposed uses for reclaimed domestic wastewater that may require different water quality.

The Commission found no reason to reassess the treatment standards adopted for reclaimed domestic wastewater. The Commission, in the 2000 rulemaking, found those standards to be appropriate for the use of reclaimed domestic wastewater for landscape irrigation and the Commission finds them to be sufficiently protective of public health and the environment for the additional approved industrial and commercial uses when best management practices are employed.

The Commission modified the treatment requirements for reclaimed domestic wastewater by replacing the term "oxidized" with "secondary treatment." Secondary treatment is generally accepted in the wastewater industry to mean that wastewater has been biologically treated to remove at least 85% of BOD and total suspended solids.

The Commission established a new section 84.8 to identify different approved uses for reclaimed domestic wastewater. A table is provided detailing the landscape irrigation, industrial and commercial uses approved by the Commission if such use is conducted in accordance with a Notice of Authorization under Regulation 84. Each new use is addressed below:

Cooling Tower: The Commission approved the use of reclaimed domestic wastewater in cooling towers, based on findings that indicate the quality of the source (make-up) water used in cooling towers is not of great concern. When best management practices typically applied at cooling towers are employed, the quality of the source water does not increase any risk to public health or the environment. Cooling towers are not accessible to the public and are maintained in a fashion that the water quality inside the cooling tower is controlled to standards that protect human health, regardless of the make-up water quality.

Concrete Mixing and Washout: The Commission approved the use of Category 1 reclaimed domestic wastewater in concrete batching processes where the water is mechanically dispensed into the truck mixer drum through a metal chute. This use of reclaimed domestic wastewater is protective of public health and the environment due to the fact that the water is dispensed by computer operated equipment, preventing worker contact, and the high pH of batched concrete would not allow the growth of

microorganisms. Additionally, the water is entrained in the concrete and, therefore, is not discharged to surface or groundwater. Due to the potential for public and worker exposure, Category 1 reclaimed domestic wastewater may not be used for purposes other than mixing of the concrete. The Commission approved using Category 2 reclaimed domestic wastewater for batching concrete, for truck wash-down purposes at the plant, as an on-truck water supply to use for maintaining and adjusting concrete slump, and for wash-out purposes at the site. The Commission realizes that when proper BMPs are implemented, this use is protective of public health and the environment.

Dust Control/Soil Compaction/Mechanized Street Sweeping: The Commission approved the use of reclaimed domestic wastewater to wet down or pre-water work surfaces, for construction and demolition activities, sandblasting, soil compaction, and mechanized street washing. Approval is conditional on the user demonstrating that the application rate for these uses will not result in ponding or runoff into waters of the state, and that off-property transport of airborne particulate matter will be minimized. These uses are deemed protective of public health and the environment because the potential for public exposure for these activities when best management practices are implemented is minimal.

Closed Loop Cooling System: The Commission approved the use of reclaimed domestic wastewater in closed loop cooling systems where water circulates only within a contained system. This use results in no public exposure to reclaimed domestic wastewater, and only very limited and controlled contact by workers. Environmental risk from this use is also minimal when proper treatment and best management practices associated with the cooling processes are employed. Allowing the use pursuant to the best management practices, including discharging wastewater from the cooling process to the sanitary sewer system or other approved disposal mechanism, required by the regulation creates no greater risk to public health and the environment than using potable water in the cooling system.

Zoo Operations: The Commission approved the use of reclaimed domestic wastewater in zoo operations, including the care of captive animals. The Animal and Plant Health Inspection Service of the U.S. Department of Agriculture enforces the Animal Welfare Act, which governs the humane care and treatment of warm blooded and marine animals held in zoos. These entities must be licensed to operate, and must comply with the care and treatment standards provided by federal law. Category 2 reclaimed domestic wastewater meets or exceeds the water quality standards for zoo animals provided by federal law. Environmental and public health risk from this use is also minimal when proper best management practices associated with zoo management practices are employed. Such practices include discharging animal wastewater to the sanitary sewer system or other approved disposal mechanism, limited public access to water used for animal holding areas and habitat wash-down.

Fire Protection: The Commission determined that providing fire protection (interior sprinkler and exterior hydrants) with reclaimed water meeting Category 2 standards for commercial/industrial buildings is protective of public health when appropriate best management practices are implemented. The exposure to reclaimed water by building occupants during a fire is expected to be of short or no duration. This, coupled with the quality of Category 2 water, will not present a significantly greater risk than exposure to reclaimed water in a park or other landscape irrigation setting. Risks to fire fighters will be further mitigated due to their use of personal protective equipment and the requirement that they be educated in proper use of reclaimed water. Due to an increased risk of cross connection and potentially greater risk to public health, the Commission is not at this time specifically permitting the use of reclaimed water for hydrants in residential neighborhoods or for fire sprinkler systems at any residential structure. However, the Commission understands that the ability to use reclaimed water for such residential firefighting uses may have ramifications for both the costs associated with the construction of, and the need for, “potable” water facilities. The Commission believes, however, that such concerns can be addressed through the use of the variance provisions at section 84.12, whereby the Division can allow such uses on a case-by-case basis, subject to the proponent providing a quality of reclaimed water better than Category 2, and implementing additional BMPs that ensure the impact to public health and the environment are appropriately limited.

Where reclaimed water is used at interior sprinklers, with numerous fire protection outlets, there are increased risks of public exposure to reclaimed water during non-emergencies and for cross connections

between the reclaimed water and potable water systems. The Commission is requiring that the additional conditions listed in section 84.8(A)(7) be implemented to strictly minimize these risks.

Water used for firefighting typically becomes polluted during its use. The Commission finds that there is little increased environmental risk associated with the reclaimed water source versus a potable water source for the firefighting water. Due to the emergency nature and low frequency of occurrence, discharges from firefighting activities are exempt from NPDES permitting requirements for non-storm water discharges (40CFR Part 122, §122.26) and shall likewise be exempt from the 'no discharge to waters of the State' provision in section 84.4 of this Regulation.

The Commission reorganized and edited section 84.9 [formerly 84.7] to address conditions for each different type of use of reclaimed domestic wastewater. Users must address each condition in a "User Plan to Comply" which varies for each type of use. (Under section 84.6, a treater must submit a User Plan to Comply for each of its users, certify that it will implement its Reuse Management Plan, and monitor the user's compliance with the User Plan to Comply and the requirements of Regulation 84.) Industrial and commercial users must submit a User Plan to Comply that describes the industrial or commercial operation or process using reclaimed domestic wastewater, an analysis of the specific use's potential risks to public health and the environment, and best management practices the user will employ to minimize such potential risks. The User Plan to Comply also includes a certification by the user that its use of reclaimed domestic wastewater is consistent with Regulation 84's purpose of protecting public health and the environment.

Modifications to this section include the following:

- 84.9(A) sets forth the conditions for the application of reclaimed domestic wastewater for landscape irrigation.

- 84.9(B) is a new section setting forth the conditions for industrial and commercial users.

- 84.9(C) sets forth conditions for use applicable to all users, regardless of type. Each of these conditions previously applied only to landscape irrigation users. [formerly 84.7(A)(1), 84.7(A)(2), 84.7(A)(3), 84.7(A)(4), 84.7(C), 84.7(E), 84.7(F), 84.7(G), 84.7(H), 84.7(I), 84.7(J), 84.7(L) and 84.7(M).]

- Former Section 84.7(D) required users to comply with the piping design guidelines contained in AWWA Manual M-24, Dual Water Systems, (AWWA, Denver, CO 1994). This reference was eliminated because the referenced guidelines are not applicable to users' irrigation, industrial and commercial piping systems. Section 84.6(A)(2) of the amended regulation requires the treater to submit proof it has obtained site application approval and design approvals pursuant to the requirements of Regulation No. 22. Treaters' location and design plans and specifications are reviewed by the Division pursuant to Regulation No. 22. It is the intent of the Water Quality Control Division to use AWWA Manual M-24 as guidance during this review.

Section 84.10 [formerly 84.8], which establishes additional conditions for the use of Category 1 reclaimed domestic wastewater, was revised for clarity, completeness, and consistency with other revisions.

The Commission revised section 84.11 [formerly 84.9] to account for industrial and commercial uses, and to eliminate previous monitoring requirements that were impractical and burdensome for treaters and users. Users of Category 1 reclaimed domestic wastewater for landscape irrigation must confirm that application occurred during authorized times instead of requiring the keeping of records showing the actual dates and times that restricted use water was used. This requirement saves time for the treaters, users and the Division while maintaining the original intent.

Section 84.12 [formerly 84.10] was revised for clarity, completeness, and consistency with other revisions. Section 84.13 [formerly 84.11] regarding enforcement was revised for clarity, completeness, and consistency with other revisions.

PARTIES TO THE RULEMAKING HEARING

1. Rangeview Metropolitan District
2. Colorado Wastewater Utility Council
3. The City and County of Denver, Board of Water Commissioners
4. The City of Westminster
5. Airpark Metropolitan District
6. Parker Water and Sanitation District
7. RG Consulting Engineers
8. Xcel Energy
9. Colorado Rock Products Association

84.23 STATEMENT OF BASIS, SPECIFIC STATUTORY AUTHORITY, AND PURPOSE (AUGUST, 2005 HEARING, ADOPTED OCTOBER 11, 2005 AND EFFECTIVE NOVEMBER 30, 2005)

The provisions of sections 25-8-205(1) and 25-8-308(1)(h) C.R.S. provide the specific statutory authority for adoption of amendments to this regulation. The Commission also adopted, in compliance with section 24-4-203(4), C.R.S., the following statement of basis and purpose.

Basis and Purpose

On February 14, 2005, the Water Quality Control Division and the Joint Water Reuse Committee of the Rocky Mountain Section American Water Works Association and Rocky Mountain Water Environment Association ("Joint Committee") requested that the Commission review Regulation No. 84 for the purpose of considering additional uses of reclaimed water and other changes to the regulation. On August 8, 2005, the Commission held a rulemaking hearing during which several modifications and additions to the regulation were adopted.

As a result of this rulemaking, the Commission amended Regulation No. 84 to continue to promote the use of reclaimed water. The regulation, as amended, extends its framework to include additional uses or reclaimed water and accompanying requirements to ensure protection of public health and the environment. Specifically, the Commission is requiring reclaimed water to meet minimum standards commensurate with the risks associated with the new uses. Also, treaters and users are required to employ appropriate best management practices and to oversee the use of reclaimed water for such uses.

The Commission concludes that these amendments to Regulation No. 84 are reasonable considering the economic, environmental, and public health costs, benefits and impacts of the water reuse program.

The term "reclaimed domestic wastewater" was changed to "reclaimed water" throughout the Regulation. "Reclaimed water" is the term used in the water reuse regulations of most other states and is also used in EPA's 2004 Guidelines for Water Reuse. It is desirable to use a common term for this highly treated water as this will assist with public education efforts.

The Commission modified section 84.4 to delete provisions that are no longer applicable and relocated the exemption for irrigation at wastewater treatment facilities to the definition of Landscape Irrigation. The Commission also added, deleted, and modified definitions to increase clarity and to achieve consistency with earlier revisions to this regulation and with other regulations. The definition of "Agricultural Use" was deleted since the regulation does not address this use at this time. The definition of "Agronomic Rate" was expanded to include watering requirements of plants in order to reinforce the Commission's intent that passage of nutrients below the root zone be strictly minimized. This change operates in conjunction with revisions to sections 84.6(A)(3) and 84.9(A)(4). Specific uses such as Closed Loop Cooling System,

Dust Control, and Fire Protection – Non Residential were deleted from section 84.8(A) and are now defined in section 84.5. The definition of "Closed Loop Cooling System" added to Section 84.5 parallels the language currently found in section 84.8(A)(5) of the rule. It is the Commission's intent that all types of closed loop cooling systems falling within this definition are authorized to use reclaimed water. This includes re-circulating evaporative cooling systems and associated cooling water storage facilities that may be employed in the electric generation industry where public access is not allowed such as the use that has been in place at Platte River Power Authority since 1981. Definitions for "Resident-Controlled Landscape Irrigation" and "Fire Protection – Residential" were also added. For purposes of this regulation, residential areas are land use planning areas zoned for residential use, or otherwise designated for residential use by the applicable local land use planning authority.

The Commission revised section 84.6(A)(3) to require a specific analysis, prior to issuance of a Notice of Authorization, to demonstrate that reclaimed water will be applied at agronomic rates. This was done to ensure that land application done under Regulation No. 84 is protective of ground water quality in light of the Commission's adoption of revisions to Regulation No. 61 that provide an exemption from the requirement to obtain a discharge permit, in such situations. Similarly, the Commission revised the best management practice at section 84.9(A)(4) to add additional protections for ground water.

In situations where there are applicable limitations on concentration or loading of phosphorus or nitrogen under a control regulation or TMDL, the Commission modified sections 84.6(A)(9) and 84.6(E)(6) to provide an option, at the request of the treater, to have such limitations addressed in the Notice of Authorization. Otherwise, such limitations must be included in a discharge permit issued pursuant to Regulation No. 61.

The Commission refined section 84.6(E)(7) regarding the requirement for a treater to request an amendment to the Notice of Authorization.

The Commission adopted standards and other requirements for Category 3 reclaimed water to apply to two newly authorized uses of reclaimed water. Specific Category 3 uses authorized include the use of reclaimed water for fire protection in residential areas and for landscape irrigation where a single-family resident has control of the plumbing and/or the time of irrigation. When compared with those uses where Category 1 or Category 2 reclaimed water is allowed, uses requiring Category 3 water may present an increased risk of consumption of reclaimed water due to the fact that the number of entities (e.g., single family residents) who control connections after initial construction will significantly increase and these individuals will also control the time and manner in which irrigation takes place. This increases both the possibility of a cross-connection between the reclaimed water and potable water systems and the risk of public contact with reclaimed water. Given this increased risk, the Commission adopted a standard for Category 3 reclaimed water that requires that *E. coli* not be detected in 75% of samples collected in any 30-day period, with a single-sample maximum for *E. coli* of 126 colony forming units (cfu) per 100 milliliters (ml) or a most probable number (MPN) of 126 per 100 ml, depending upon the analytical enumeration method used. This standard recognizes that it is not practical to meet a no detect standard for an indicator organism at all times and is consistent with regulatory requirements used in other states (e.g. Florida) and with the recommendations of the EPA. The rationale for selecting 126 cfu (or MPN) per 100 ml as the single sample maximum standard is consistent with the rationale supporting the *E. coli* standard for Category 1 and 2 reclaimed water. The Commission found that the *E. coli* standard is protective of the public health and environment where Category 3 reclaimed water is used in a manner compliant with the other requirements contained in the regulation.

The Commission exercised its discretion, pursuant to Citizens for Free Enterprise v. Department of Revenue, 649 P.2d 1054 (Col. 1982) to adopt these requirements based upon policy considerations about the possible increased risks to public health associated with the Category 3 uses as opposed to specific scientific evidence to that effect.

In addition to compliance with the *E. coli* standard, treaters and users of Category 3 reclaimed water are required to develop and implement appropriate additional best management practices, including public

education, to strictly reduce the risk of cross-connections between the reclaimed water and potable water systems. Additional conditions required for Category 3 uses are listed in sections 84.8(A) and 84.9(A).

As revised, section 84.8(A) requires that at a minimum, the numbered conditions indicated in the last column of Table A are required for the corresponding uses. In addition, in accordance with the authority provided in section 84.6(E), the Division may require additional conditions listed in section 84.8(A) for individual reuse activities as it determines appropriate.

The Commission decided not to include specific requirements for continuous disinfection of Category 3 reclaimed water but notes that the requirements for monitoring to determine the quality of all categories of reclaimed water should include frequent determinations to assure that disinfection is being provided prior to use.

The Commission deleted section 84.10 and added provisions to section 84.9(A)(5) regarding the mechanisms that users of Category 1 reclaimed water must employ to restrict access to areas when irrigation is taking place.

In order to avoid the need to commit an excessive amount of Division resources for regulatory oversight when Category 3 reclaimed water is used, section 84.9(A)(6) requires the treater to assume responsibility for the numerous residential users inherent when reclaimed water is used for resident-controlled landscape irrigation and there is not an acceptable entity (e.g., homeowners' association) to assume said responsibility.

The Commission moved the provisions of section 84.11(C) to subsection (B) of new section 84.10 and also added a specific requirement to report violations pursuant to new section 84.10(C)(1).

At the time the Commission initially adopted the Variance provision in Section 84.12, it excluded authorization to the Division to provide a variance for the *E. coli* standards. The Commission now concludes that it is appropriate to provide a variance from the "235/100 ml single sample maximum"standard on a case-by-case basis. For example, testimony was received from the City of Fort Collins and the Platte River Power Authority concerning a use that has been in effect since 1981 without incident. Some of the effluent from the city's Drake facility is pumped 27 miles in an underground pipeline for ultimate addition to Platte River's 16,000 acre foot, 500 surface acre long term carryover storage reservoir for recirculating cooling water use at the Rawhide energy station. There is no public access to any part of the process and as a result, there is no public exposure to reclaimed water and potential worker exposure is adequately limited and controlled with safety procedures and best management practices. To avoid the necessity for capital and operational costs for investments associated with meeting the single sample maximum standard in the regulation, Fort Collins and Platte River requested a limited change in the Division's authority to grant a variance from this aspect of the *E.coli* standard. When Regulation 84 was adopted in 2000, the Commission noted in its Statement of Basis that reclaimed domestic wastewater systems had been constructed and been in operation prior to the adoption of the regulation. It was emphasized that this regulation is not intended to force existing systems to make capital improvements solely for assuring standardization if they accomplish the objectives of this regulation. The Commission has determined it is appropriate to provide authority to the Division to grant a variance from the single sample maximum standard when it concludes that the cost of compliance does not bear a reasonable relationship to the environmental or public health benefits.

As noted in the Statement of Basis when the Commission added *E.coli* to the Basic Standards for Surface Waters in 2000, there is great variability in individual bacteriological samples because bacteria are not uniformly distributed in water samples. A single sample may give a false impression of potential risk of violation of a standard based on a geometric mean. In cases where there is limited or no public exposure and potential worker exposure is controlled by best management work place standards, the resulting lower risk warrants the option for the Division to consider a variance from the single sample maximum standard.

The Commission also corrected references to "E coli" in Regulation No. 84 to the italicized *E coli*.

PARTIES TO THE RULEMAKING HEARING

1. RMWEA/RMSAWWA Water Reuse Joint Committee
2. Platte River Power Authority
3. Plum Creek Wastewater Authority
4. Dominion Water & Sanitation District
5. Eastern Adams County Metropolitan District
6. The City of Aurora
7. Xcel Energy

84.24 STATEMENT OF BASIS, SPECIFIC STATUTORY AUTHORITY, AND PURPOSE (August, 2007 Hearing)

The provisions of sections 25-8-205(1) and 25-8-308(1)(h) C.R.S. provide the specific statutory authority for adoption of amendments to this regulation. The Commission also adopted, in compliance with section 24-4-203(4), C.R.S., the following statement of basis and purpose.

Basis and Purpose:

Regulation 84.4 was amended to state that wastewater that has been treated and is used at a domestic wastewater treatment plant (DWWTP) site for landscape or process uses is not subject to Regulation 84. Landscape irrigation with treated effluent at a DWWTP was previously excluded in the definition of landscape irrigation. Section 84.5(10). This exclusion was deleted from the definitions section and moved to the applicability section 84.4, together with a new exclusion dealing with process waters used at a DWWTP site. The Commission believes it is more logical to include these exclusions in the section dealing with applicability.

The Commission found that it is appropriate to exclude process water used at a DWWTP site because process water uses are restricted to the DWWTP site and access to these sites is restricted and not open to the public. The use of process water is limited and controlled by DWWTP staff who are trained in the handling and use of process water. It is the Commission's intention that after the process use is completed, the process water will be captured and returned to the wastewater treatment process and not discharged separately to waters of the state.

The Commission deleted the provision in section 84.6(A)(3) that allowed landscape irrigation to be done above agronomic rates where the treater or user, as appropriate, had obtained a CDPS ground water discharge permit. The Commission understands that there are no entities currently making use of this provision and found it to be inconsistent with the original intent of Regulation 84 which was to address the use of reclaimed water under a single regulation. In addition the Commission finds, based on the typical nutrient content of treated wastewater and the watering needs of landscape plants, that application of reclaimed water at agronomic rates is achievable under normal circumstances.

84.25 STATEMENT OF BASIS, SPECIFIC STATUTORY AUTHORITY, AND PURPOSE (May, 2013 Hearing)

The provisions of sections 25-8-205(1) and 25-8-308(1)(h) C.R.S. provide the specific statutory authority for adoption of amendments to this regulation. The Commission also adopted, in compliance with section 24-4-203(4), C.R.S., the following statement of basis and purpose.

Basis and Purpose:

The use of reclaimed water has significantly increased in Colorado over the past decade and Treaters and potential Users of reclaimed water have identified an interest in new uses for reclaimed water that are not currently authorized under Regulation No. 84. Proponents from the Joint Water Reuse Committee of the Rocky Mountain Section American Water Works Association and Rocky Mountain Water Environment Association ("RMSAWWA/RMWEA") and the Colorado Section of the WateReuse Association, participating in a Water Quality Forum Work Group, requested that the Commission review Regulation No. 84 for the purpose of considering additional uses of reclaimed water.

As the Commission indicated in its initial adoption of Regulation No. 84, the use of reclaimed water is subject to Colorado water rights law. Several large municipalities have the right to use a portion of their water supply "to extinction" under Colorado law and have significant amounts of such water that are currently being discharged from the wastewater treatment facility rather than being further treated and reused.

In the 2010 triennial review for Regulation No. 84, the Commission discussed ideas that the Division and interested parties had brought forth for adopting new uses including modifying the regulation to establish broader categories of uses within which the Division could approve new uses. The Commission understands that the Division would need additional resources to implement such a scheme. However, in the interest of addressing the growing use of reclaimed water in Colorado in a timely manner, the Commission approved the renaming and addition of several specific new uses through these modifications to Regulation No. 84.

The Commission found that the following modifications to the nomenclature for authorized uses in Section 84.8 Table A are consistent with the intent of the original authorization of these uses, and presents no increase in the potential risk to human health or the environment. By modifying the nomenclature and clarifying the definition of these approved uses, similar industrial and commercial uses with similar human exposure, environmental release potential, and cross-connection potentials will be afforded the same protections under Regulation 84 and the individual Notices of Authorization issued by the Division.

- "Cooling Tower" was renamed "Evaporative Industrial Processes"
- "Closed Loop Cooling System" was renamed "Non-Evaporative Industrial Processes"
- "Dust Control", "Soil Compaction", and "Mechanized Street Cleaning" were combined and renamed "Non-Discharging Construction and Road Maintenance"
- "Concrete Mixing and Washout" was divided into two uses, "Non-Evaporative Industrial Processes" and "Washwater Applications," respectively

The Commission found that adding several new uses, with appropriate conditions placed on their use, will further facilitate the safe and efficient use of Colorado's limited water resources. The Commission approved the addition of the following Commercial Uses: Commercial Laundries, Automated Vehicle Washing, and Manual Non-Public Vehicle Washing, and a new Agricultural Irrigation use.

Evaporative Industrial Processes

The Evaporative Industrial Processes use includes, but is not limited to, the following representative applications where water is used in an industrial process where the benefit of such use requires the evaporation of water, requiring additional make-up water: cooling tower use and gas and odor adsorption. In modifying the nomenclature for this category so that it now covers multiple evaporative industrial process uses, the Commission recognized that many evaporative industrial processes have the potential to use reclaimed water instead of potable or other water supplies, with similar low potential for human exposure, releases to the environment, and cross connections. It is the Commission's intent that no discharges to waters of the state shall be allowed with this use unless authorized via an approved permit under the Colorado Discharge Permit System (CDPS).

Non-Evaporative Industrial Processes

The Non-Evaporative Industrial Processes use includes, but is not limited to, the following representative applications where water is used in an industrial process, is not evaporated in the process, is used within a contained system, and is either discharged to a sewer system as a blow down (e.g., closed loop cooling systems) or is incorporated into a product that is not intended for personal contact or ingestion (e.g., those in which the water is retained in the product and conditions prevent excessive microorganism growth, such as the high pH of batched concrete): closed loop cooling systems (a previously-approved use, Sections 84.8 and 84.22), concrete makeup water (a previously-approved use as concrete mixing and washout, Sections 84.8 and 84.22), boiler feed water, water for lime slaking, and industrial process makeup water. In modifying the nomenclature for this category so that it now covers multiple non-evaporative industrial process uses, the Commission recognized that many industrial processes have the potential to use reclaimed water instead of potable or other water supplies, with similar low potential for human exposure, releases to the environment, and cross connections. It is the Commission's intent that no discharges to waters of the state shall be allowed with this use unless authorized via an approved permit under the CDPS.

Non-Discharging Construction and Road Maintenance

This approved use incorporates the following previously-approved representative uses for Mechanized Street Sweeping, Soil Compaction, and Dust Control. Other similar uses of water, including but not limited to cooling water for pavement cutting operations, are also authorized under this approved use. It is the Commission's intent that no discharges to waters of the state shall be allowed with this use unless authorized via an approved permit under the CDPS.

Washwater Applications

The Commission approved the new Washwater Applications use, which includes concrete washout as previously approved under Concrete Mixing and Washout. Washwater Applications would also include water used in washing of miscellaneous equipment, washing of product in mineral processing, and other similar uses where reclaimed water is used to remove material from equipment or a product. This use has been evaluated for risks to human health via ingestion, inhalation, and dermal contact. Best management practices (BMPs, specified as Additional Conditions in Section 84.8 and 84.9) and allowable water qualities are specified to mitigate these risks. It is the Commission's intent that no discharges to waters of the state shall be allowed with this use unless authorized via an approved permit under the CDPS.

Commercial Laundries, Automated Vehicle Washing, and Manual Non-Public Vehicle Washing

The Commission approved three new uses not previously authorized under Regulation 84 (Commercial Laundries, Automated Vehicle Washing, and Manual Non-Public Vehicle Washing) based upon an evaluation of the potential human health risks via ingestion, inhalation, dermal contact and cross-connection as well as the potential for discharging reclaimed water to a water of the state (groundwater or surface water). BMPs for each use and allowable water qualities were specified to minimize these risks. In assessing the proposed modifications to Regulation 84, typical uses of water in commercial laundries and automated and manual vehicle washing facilities were reviewed to characterize the likelihood and impacts of human contact with reclaimed water and releases of reclaimed water to waters of the state.

The Commission found that the potential for ingestion is negligible for all three proposed uses, in light of the limited access to the public and the commercial and industrial nature of the water use. The risk of ingestion in these new uses is further mitigated by the BMPs specified for these uses in Regulation 84. In light of the potential worker or public contact with aerosols in vehicle washing applications, the Commission considered additional information to assess the potential for human health effects of such contact. This information included the 2012 USEPA Guidelines for Water Reuse, regulations in other states that authorize commercial laundry and vehicle washing uses, a risk assessment based on available research and literature regarding health impacts of inhalation of recycled water aerosols, and a comparison of water quality in internally-recycled vehicle washing water systems fed by potable water to the water quality of recycled water produced by an existing Treater. This indicated to the Commission that a high level of disinfection is appropriate for situations where there is a high likelihood of frequent worker contact with reclaimed water aerosols. Alternatively, BMPs should be employed to prevent frequent worker inhalation exposure if less stringent disinfection is employed.

The Commission found that:

- Secondary treatment and disinfection (Category 2 Reclaimed Water) is an appropriate treatment requirement for the use of reclaimed water in commercial laundry and vehicle washing facilities where there is no frequent worker or public exposure to aerosols generated from reclaimed water use.
- In facilities with a high likelihood of frequent worker or public exposure to aerosols generated from reclaimed water use, filtration and high-level disinfection (Category 3 Reclaimed Water) provides human health protection against aerosol inhalation risks. Alternatively, BMPs must be used to prevent the frequent inhalation of aerosols with use of Reclaimed Water Category 2.
- Effective BMPs for physically preventing frequent human contact with aerosols may include 100-foot setback distances (similar to the irrigation setback from water supply wells specified under Section 84.9(C)(9), and consistent with other states' requirements for protection of food preparation or consumption areas), physical barriers such as curtains or other means of containing aerosols to the area of generation, personal protective equipment to prevent inhalation of aerosols, or other means as may be appropriate to the site and use.

Accordingly, the Commission approved the addition of the new Additional Condition at Section 84.8(A)(7). The Commission determined that this Additional Condition is applicable to the following renamed and new uses, in consideration of the type of use and potential for frequent worker or public exposure to aerosols: Washwater Applications, Non-Discharging Construction and Road Maintenance, Non-Evaporative Industrial Processes, Commercial Laundries, Automated Vehicle Washing, and Manual Non-Public Vehicle Washing.

The Commission found the overall risk to Commercial Laundry and Vehicle Washing workers and the public associated with ingestion and dermal contact is less than swimming at a swim beach and comparable to or less than other previously approved commercial and industrial uses of Category 1, 2, and 3 Reclaimed Water. For each of these proposed uses, the Commission found the potential for cross-connecting potable and recycled water piping is similar to previously approved Commercial and Industrial uses of Category 1, 2, and 3 Reclaimed Water. The existing BMPs for cross-connection control in Regulation 84 (at 84.9(C)(5), 84.9(C)(7), and 84.9(C)(8)) will apply to these new uses as well.

The Commission approved the modification of Section 84.8(A)(3) to read "Application rates or other measures shall be employed to minimize ponding on or runoff from the area approved for application or use," and specified that this Additional Condition be required for Automated Vehicle Washing and Manual Non-Public Vehicle Washing uses. It is the Commission's intent that no discharges to waters of the state shall be allowed with these uses unless authorized via an approved permit under the CDPS.

Non-Food Crop Irrigation and Silviculture

The Commission found that the use of reclaimed water for irrigation of certain agricultural crops and trees, when implemented in accordance with the reclaimed water quality standards and BMPs established in Regulation 84, is protective of public health and the environment. Adding agricultural irrigation as an approved use of reclaimed water will encourage the expanded use of reclaimed water in Colorado and is anticipated to reduce the regulatory compliance burden on Treaters and Users by allowing them to be permitted under a single control regulation where multiple approved uses of reclaimed water are implemented.

Health risks to the public or workers associated with potential contact with reclaimed water used for agricultural irrigation were determined to be of a comparable or lower magnitude than those associated with landscape irrigation. Environmental risks associated with runoff or excessive percolation of reclaimed water to waters of the state are determined to be of a comparable or lower magnitude than those risks associated with landscape irrigation. The Commission found that there is little increased risk of cross connection associated with the use of reclaimed water versus traditional sources of water used for agricultural irrigation.

The Commission found that Category 1 water is acceptable for irrigation of those non-food crops permitted to be irrigated with reclaimed water pursuant to this Control Regulation and that the criteria for Category 1 water are generally consistent with the treatment level requirements and water quality standards adopted by several other states (e.g., Arizona, California, Florida, and Texas) and countries for the irrigation of non-food crops. The Commission found that the BMPs established for restricted access landscape irrigation are appropriate and adequate for agricultural irrigation.

Annual Report Requirements

As part of this rulemaking, the Commission also revised the annual reporting provision to revise the due date of annual reports from January 31 of each year to March 31, to allow Treaters sufficient opportunity to compile reclaimed water use data and related records from the preceding calendar year.

Proponent's Exhibit 2

REGULATION NO. 84 REVISED PROPOSAL

PROPONENT'S EXHIBIT 2

COLORADO DEPARTMENT OF PUBLIC HEALTH AND ENVIRONMENT
WATER QUALITY CONTROL COMMISSION

REGULATION NO. 84
RECLAIMED WATER CONTROL REGULATION

ADOPTED:	October 10, 2000
EFFECTIVE:	November 30, 2000
TRIENNIAL REVIEW:	October 8, 2003
AMENDED:	May 10, 2004
EFFECTIVE:	June 30, 2004
AMENDED:	October 11, 2005
EFFECTIVE:	November 30, 2005
AMENDED:	August 13, 2007
EFFECTIVE:	September 30, 2007

DEPARTMENT OF PUBLIC HEALTH AND ENVIRONMENT

Water Quality Control Commission

5 CCR 1002-84

RECLAIMED WATER CONTROL REGULATION

84.1 AUTHORITY

This regulation is promulgated pursuant to the Colorado Water Quality Control Act (CWQCA) section 25-8-101 through 25-8-703, C.R.S. In particular, it is promulgated under sections 25-8-202 and 25-8-205, C.R.S.

Materials incorporated by reference are available for public inspection during normal business hours, or copies may be obtained at reasonable cost, from the Administrator, Water Quality Control Commission, 4300 Cherry Creek Drive South, Denver, Colorado 80246. Unless expressly stated otherwise, materials incorporated by reference are those editions dated as referenced by date in the regulation or in existence as of the date this regulation is promulgated or revised by the Water Quality Control Commission and references do not include later amendments to or editions of the incorporated material. All material incorporated by reference may be examined at any state publications depository.

84.2 PURPOSE

The purpose of this regulation is to establish requirements, prohibitions, standards and concentration limits for the use of reclaimed water to protect public health and the environment while encouraging the use of reclaimed water.

84.3 SEVERABILITY

The provisions of this regulation are severable, and if any provisions or the application of the provisions to any circumstances is held invalid, the application of such provision to other circumstances, and the remainder of this regulation shall not be affected thereby.

84.4 APPLICABILITY

This regulation applies to the use of reclaimed water for landscape irrigation, agricultural irrigation, fire protection, industrial, and commercial uses identified in section 84.8 of this regulation. This regulation does not apply to wastewater that has been treated and released to state waters prior to subsequent use or to wastewater that has been treated and used at a domestic wastewater treatment plant site for landscape irrigation or process uses. This regulation applies to individual treaters and users, as defined below, upon the issuance of a Notice of Authorization pursuant to section 84.6(C) herein by the Water Quality Control Division.

84.5 DEFINITIONS

The following definitions shall apply:

(1) Agricultural Irrigation means use of reclaimed water for the irrigation of crops and trees, excluding crops produced for direct human consumption, crops where lactating dairy animals forage, and trees that produce nuts or fruit intended for human consumption.

(2) Agricultural Irrigation User means a person who uses reclaimed water for the purpose of agricultural irrigation.

~~(1)~~(3) Agronomic Rate means the rate of application of reclaimed water and associated nutrients to plants that is necessary to satisfy the plants' nutritional and watering requirements while strictly minimizing the amount of nutrients that run off to surface waters or which pass below the root zone of the plants.

~~(2) Closed Loop Cooling System means a cooling system that has negligible exposure potential to workers and, where applicable, to the public.~~

(4) Automated Vehicle Washing means the cleaning of vehicles and associated equipment, such as trailers, where automated equipment is used to apply spray water, cleaning products, and/or rinse water, where there is no public exposure to reclaimed water under normal operations and only limited and controlled contact with reclaimed water by trained workers.

(5) Commercial Laundry means a facility that uses water to clean clothing and other textile products where only laundry workers operate the washing machines and cleaning equipment, where there is no public exposure to reclaimed water under normal operations and only limited and controlled contact with reclaimed water by trained workers.

~~(3)~~(6) Commercial User means a person who uses reclaimed water in the operation of a business listed in Table A of section 84.8.

~~(4)~~(7) Division means the Water Quality Control Division of the Colorado Department of Public Health and Environment.

~~(5) Dust Control means the wetting down or pre-watering of work surfaces, work areas, and roads to minimize the off-property transport of airborne particulate matter from activities such as construction, demolition, and sandblasting.~~

(8) Evaporative Industrial Processes means the use of water in an industrial process where the benefit of such use requires the evaporation of water, requiring additional make-up water, where there is no public exposure to reclaimed water under normal operations and only limited and controlled contact with reclaimed water by trained workers.

~~(6)~~(9) Fire Protection -- Nonresidential means firefighting activities where water is made available at fire hydrants located in areas other than residential, from fire trucks, and in fire sprinkler and interior standpipe systems in buildings in commercial/industrial areas.

~~(7)~~(10) Fire Protection -- Residential means firefighting activities where water is made available at fire hydrants in residential areas, from fire trucks, and in fire sprinkler and interior standpipe systems at any structure where the occupants do not have access to the plumbing for maintenance and repair.

~~(8)~~(11) Industrial User means a person who uses reclaimed water for industrial processes or in the construction process. Approved industrial uses are listed in Table A of section 84.8.

~~(9)~~(12) Irrigation System means the facilities, piping and other equipment used by a Landscape Irrigation User or an Agricultural Irrigation User.

~~(10)~~(13) Landscape Irrigation means irrigation of areas of grass, trees, and other vegetation that are accessible to the public, including, but not limited to, parks, greenbelts, golf courses, and common areas at apartments, townhouses, commercial/business parks, and other similar complexes.

~~(11)~~(14) Landscape Irrigation User means a person who uses reclaimed water for the purpose of landscape irrigation.

(15) Manual Non-Public Vehicle Washing means the cleaning of vehicles and associated equipment, such as trailers, where any or all of the following are applied manually in the cleaning process: spray water, cleaning products, and/or rinse water; where there is no public access to the vehicle washing facility and only limited and controlled contact with reclaimed water by trained workers,

(16) Non-Discharging Construction and Road Maintenance means the use of reclaimed water for nonpotable applications where water is required for cooling, wetting, dust suppression, or other construction and road maintenance activities, where there is no public exposure to reclaimed water under normal operations and only limited and controlled contact with reclaimed water by trained workers.

(17) Non-Evaporative Industrial Processes means the use of water in an industrial process where water is not evaporated in the process and is used within a contained system, where there is no public exposure to reclaimed water under normal operations and only limited and controlled contact with reclaimed water by trained workers.

~~(12)~~(18) Person means an individual, corporation, partnership, association, state or political subdivision thereof, federal agency, state agency, municipality, commission, or interstate body.

~~(13)~~(19) Point of Compliance means a point identified by the treater in the reclaimed water treatment or transmission system after all treatment has been completed and prior to dilution and blending.

~~(14)~~(20) Reclaimed Water is domestic wastewater that has received secondary treatment by a domestic wastewater treatment works and such additional treatment as to enable the wastewater to meet the standards for approved uses.

~~(15)~~(21) Resident-Controlled Landscape Irrigation means irrigation of areas of grass, trees and other vegetation located on the property of a single family or other residential occupancy where the occupant is the User and is responsible for the maintenance and/or operation of the irrigation system.

~~(16)~~(22) Restricted Access means controlled and limited access to the areas where reclaimed water meeting Category 1 standards, as defined in section 84.7, is used.

(23) Trained Worker means a person employed at the site where reclaimed water is used, who has been provided with the information specific to the additional conditions specified in section 84.8 that are applicable to that site's approved use(s) of reclaimed water.

~~(17)~~(24) Transmission System means the treater's facilities that transport treated reclaimed water between the treater and users.

~~(18)~~(25) Treater means a person who treats and provides reclaimed water to a user for the purpose of landscape irrigation, agricultural irrigation, fire protection, commercial use or industrial use. The treater and the user may be the same entity.

~~(19)~~(26) Unrestricted Access means uncontrolled access to the areas where reclaimed water meeting the Category 2 standards, as defined in section 84.7, is used.

~~(20)~~(27) User means a person who uses reclaimed water for landscape irrigation, agricultural irrigation, fire protection, commercial or industrial uses.

~~(21)~~(28) User Plan to Comply means the information and documentation a user is required to submit to the treater under sections 84.9 of this regulation.

(29) Washwater Applications means water used in washing of miscellaneous construction/maintenance equipment, as well as concrete washout, mineral processing, and other similar uses where reclaimed water is used to remove material from equipment or a desired product, where there is no public exposure to reclaimed water under normal operations and only limited and controlled contact with reclaimed water by trained workers.

84.6 ADMINISTRATION

(A) Letters of Intent.

Treaters shall submit Letters of Intent to the Division and to the local health authority that shall include:

(1) Treater information including name of entity; legally responsible person's name, address, telephone number, and email address; and for each facility owned and/or operated by the treater where domestic wastewater is treated for transmission, the facility contact person's name, address, telephone number, and email address (if different than legally responsible person).

(2) Information demonstrating the treater's ability to comply with the applicable reclaimed water standards described in section 84.7 of this regulation, including an 8.5" x 11" or 11" x 17" schematic of the treatment process showing the location of the proposed point(s) of compliance. Include the point of compliance for demonstration that secondary treatment has been attained which may be the same or different than the point where attainment of reclaimed water standards will be demonstrated. Include either: a copy of the site application approval letter and the approval letter for the reclaimed water treatment facility plans and specifications; or evidence of submittal of a site application and plans and specifications to the Division.

(3) An analysis that demonstrates that reclaimed water used for landscape irrigation or agricultural irrigation will be applied at or below agronomic rates. Landscape irrigation and agricultural irrigation uses may also be subject to waste load allocations or limits as contained in a Total Maximum Daily Load (TMDL) or control regulation governing the watershed within which the irrigation occurs.

(4) A reuse system management plan which includes: a description of the proposed reclaimed water treatment and transmission systems; a description of the treater's program to inform and educate users on the requirements of this regulation; a description of the treater's plan to oversee the use of reclaimed water by users to ensure, to the maximum extent practicable, that users attain and maintain compliance with this regulation; and evidence of the treater's legal ability (regulation, ordinance, contract, or other acceptable mechanism) to terminate service to a user if the user fails to comply with this regulation.

(5) A certification statement as per section 84.13 of this regulation.

(6) For each user, a "User Plan to Comply" developed in cooperation with the treater and meeting the requirements of section 84.9.

(7) Affirmation that the reuse of this water by the treater will not materially injure water rights.

(8) When reclaimed water is used for fire protection, the Letter of Intent shall also include a map indicating areas where reclaimed water is to be supplied for fire protection uses and identifying the fire protection authority(s) having jurisdiction. The Letter of Intent shall also include a letter from the fire protection authority(s) having jurisdiction indicating their approval of using reclaimed water for fire protection activities.

(9) Where the land application of reclaimed water is subject to limitations on concentration and/or loading of nitrogen or phosphorus pursuant to a control regulation adopted by the Water Quality Control Commission, a statement as to whether the treater intends to have such limitations included in the Notice of Authorization issued under this regulation or under a permit issued pursuant to Regulation No. 61.

(B) Division Review. The treater shall be notified in writing not more than thirty (30) calendar days after receipt of a Letter of Intent by the Division if, and in what respects, the Letter of Intent is incomplete. Upon the written agreement of the treater, the review period may be extended for a period mutually agreed to by the treater and the Division. Where information provided by a user is incomplete, the treater may amend the Letter of Intent to address the deficiency or to remove that user from the Letter of Intent.

(C) Issuance of Notices of Authorization. The Division shall either issue or deny the Notice of Authorization within thirty (30) calendar days of its determination that the Letter of Intent is complete. Upon the written agreement of the treater, the review period may be extended for a period mutually agreed to by the treater and the Division. The treater shall be notified in writing upon denial of the Notice of Authorization of such action and the reason(s) for the denial. The Division shall issue separate Notices of Authorization to the treater and to each user. Treaters and users planning to use reclaimed water shall have or obtain a Notice of Authorization from the Division prior to any use of reclaimed water.

(D) Appeal of Issuance or Denial of Notice of Authorization. The treater or user, or any other person potentially adversely affected or aggrieved by Division issuance or denial of a Notice of Authorization, may submit a request, within thirty (30) days of the date of issuance or denial, to the Administrator of the Water Quality Control Commission ("Commission"), for a hearing.

(1) Such hearing shall be conducted pursuant to the requirements of the Procedural Regulations for all Proceedings before the Commission and the Division, Regulation No. 21, 5 CCR 1002-21.

(2) The person requesting the hearing shall have the burden of proof in all hearings held pursuant to this section.

(E) Terms and Conditions of Notices of Authorization. Notices of Authorization (NOAs) issued by the Division shall contain such terms, limitations, and conditions as are deemed necessary by the Division to ensure compliance with this regulation, except for those NOAs that contain a schedule of compliance as determined by the Division. At a minimum, all NOAs shall contain the following:

(1) Treater information including name of entity; legally responsible person's name, address, telephone number, and email address; and for each facility owned and/or operated by the treater where domestic wastewater is treated for distribution, the facility contact person's name, address, telephone number, and email address (if different than legally responsible person). For the treater NOA, a list of approved users and their associated uses shall be included;

(2) Issuance date;

(3) The approved uses as defined in Table A of section 84.8, including the category of reclaimed water and the associated numeric limit for each use from section 84.7;

(4) For User NOAs, the location(s) of use, a description of the approved use(s), and best management practices that meet the requirements of subsection 84.9(A) or (B), as applicable and 84.9(C);

(5) A requirement that the treater implement its reuse system management plan that meets the requirements of subsection 84.6(A)(4) to ensure user compliance with this regulation. For User NOAs, include a requirement that the user comply with the User Plan to Comply;

(6) Where the treater has so requested in the Letter of Intent per Section 84.6(A)(9), conditions defining limitations for concentration and loading of nitrogen and/or phosphorus pursuant to a control regulation adopted by the Water Quality Control Commission.

(7) A requirement to submit information to the Division requesting the amendment of a Letter of Intent prior to making any of the following significant changes:

(a) Adding an additional user or deleting a user;

(b) When a treater proposes any significant physical or operational changes;

(c) If reclaimed water is used for irrigation, when there is a significant change in the agronomic rate analysis; and

(d) When any user governed by an existing Notice of Authorization significantly modifies or changes its physical or operational use of reclaimed water, including, but not limited to, the addition of landscape area to be irrigated that is not contiguous to an existing approved area, addition of areas where reclaimed water is to be used for fire protection, addition of a new user or use in a new commercial or industrial process, or use in a new location.

Said request for amending the Letter of Intent shall be made at least thirty days prior to implementing a change described in subsections (a) or (c), above, and at least sixty days prior to implementing a change described by subsections (b) or (d), above.

(8) Terms for modification, revocation, or termination;

(9) Required monitoring, as is reasonably necessary, to be performed by the user;

(10) Reporting and record keeping requirements;

(11) Public access restrictions, if applicable; and

(12) A statement of applicable civil and criminal penalties.

84.7 RECLAIMED WATER CATEGORIES AND STANDARDS

(A) Category 1 Standards: Reclaimed water, for uses where Category 1 water is required, shall, at a minimum, receive secondary treatment with disinfection. The following reclaimed water standards shall apply at the point of compliance:

Parameter	Limit
E. coli/100 ml	126/100 ml monthly geometric mean and 235/100 ml single sample maximum.
Total Suspended Solids	30 mg/L as a daily maximum.

(B) Category 2 Standards: Reclaimed water, for uses where Category 2 water is required, shall, at a minimum, receive secondary treatment with filtration and disinfection. The following reclaimed water standards shall apply at the point of compliance:

Parameter	Limit
E. coli/100 ml	126/100 ml monthly geometric mean and 235/100 ml single sample maximum.
Turbidity, NTU	Not to exceed 3 NTU as a monthly average and not to exceed 5 NTU in more than 5 percent of the individual analytical results during any calendar month.

(C) Category 3 Standards: Reclaimed water for uses where Category 3 water is required shall, at a minimum, receive secondary treatment with filtration and disinfection. The following reclaimed water standards shall apply at the point of compliance:

Parameter	Limit
E. coli/100 ml	None detected in at least 75% of samples in a calendar month and 126/100 ml single sample maximum.
Turbidity, NTU	Not to exceed 3 NTU as a monthly average and not to exceed 5 NTU in more than 5 percent of the individual analytical results during any calendar month.

84.8 RECLAIMED WATER USES

Table A: Approved Uses of Reclaimed Water

Approved Uses	Category 1	Category 2	Category 3	Additional Conditions Required 84.8(A)
INDUSTRIAL				
~~Cooling Tower~~Evaporative Industrial Processes	Allowed	Allowed	Allowed	1
~~Concrete Mixing and Washout~~Washwater Applications	Not Allowed	Allowed	Allowed	2,3,7
~~Dust Control~~Non-Discharging Construction and Road Maintenance	Allowed	Allowed	Allowed	3,7
~~Soil Compaction~~	~~Allowed~~	~~Allowed~~	~~Allowed~~	~~3~~
~~Closed Loop Cooling System~~Non-Evaporative Industrial Processes	Allowed	Allowed	Allowed	7
LANDSCAPE IRRIGATION				
Restricted Access	Allowed	Allowed	Allowed	
Unrestricted Access	Not Allowed	Allowed	Allowed	3,4
Resident-Controlled	Not Allowed	Not Allowed	Allowed	3,4,5

COMMERCIAL				
~~Mechanized Street Cleaning~~	~~Allowed~~	~~Allowed~~	~~Allowed~~	~~3~~
Zoo Operations	Allowed	Allowed	Allowed	
Commercial Laundries	Not Allowed	Allowed	Allowed	7
Automated Vehicle Washing	Not Allowed	Allowed	Allowed	3,7
Manual Non-Public Vehicle Washing	Not Allowed	Allowed	Allowed	3,7
FIRE PROTECTION				
Nonresidential Fire Protection	Not Allowed	Allowed	Allowed	6
Residential Fire Protection	Not Allowed	Not Allowed	Allowed	6
AGRICULTURAL IRRIGATION				
Non-Food Crop Irrigation and Silviculture	Allowed	Allowed	Allowed	3

(A) Additional Conditions Required. In addition to the conditions for use of reclaimed water listed in section 84.9, the Division will include the following best management practices in the Notices of Authorization for the associated uses listed in Table A:

(1) If there is a significant likelihood for aerosols to drift to public or worker areas, adequate signage is required. Consider supplemental disinfection and ~~chlorine~~disinfectant residual and/or public access restrictions.

(2) ~~Category 1 water is allowed in the mixing process only; washing off trucks and using as truck supply water is prohibited. Category 2 water may be used for mixing, washing and truck supply water as long as the user complies with the requirements set forth in section 84.9 of this regulation. Mixing and w~~Washing activities must be contained (e.g., flow to lined pit or approved concrete washout area, or within enclosed equipment), as to prevent any off-site runoff or discharge to ground water. ~~Truck drivers and workers~~Workers shall be trained on the proper use and ~~washout~~washing procedures when using reclaimed water.

(3) Application rates or other measures shall be employed to minimize ponding on or runoff from the area approved for application or use.

(4) No reclaimed water piping shall be extended to or supported from any residential structure and there shall be no accessible above grade outlets from the reclaimed water system at any residential structure. At least one exterior hose bib, supplied with potable water, shall be provided at each residential structure.

(5) The treater shall develop and implement a public education program to inform residents and plumbing contractors and inspectors who deal with the Resident-Controlled Landscape Irrigation systems about the need to: a) strictly prohibit cross-connections between the reclaimed water and potable water systems; b) clearly and distinctively identify the potable service lines and plumbing from the reclaimed water service lines and plumbing; and c) avoid contact with and strictly minimize ponding or runoff of the reclaimed water. The treater shall implement a cross-connection inspection program and shall have the authority to discontinue reclaimed water service to any resident who flagrantly or repeatedly misuses reclaimed water in a manner inconsistent with this regulation. The treater shall maintain a map indicating all areas where reclaimed water is provided for Resident-Controlled Landscape Irrigation.

(6) The user shall develop and implement a program, including notices in fire department newsletters and fire department preplans, to educate the public and firefighters that

reclaimed water is used for fire protection. The user shall develop a program to educate plumbing and fire protection system contractors and inspectors expected to access the fire protection system about the need to confirm that cross-connections between the reclaimed water and potable water systems do not exist and about the requirement to clearly identify the potable and reclaimed water systems throughout the building. All personnel authorized to use the reclaimed water for fire protection shall be educated to avoid contact with and strictly minimize ponding or runoff of the reclaimed water during non-emergency testing or training. An annual cross-connection inspection shall be made at each structure to which reclaimed water piping is extended for fire protection to ensure that no cross-connection exists. The treater shall maintain a map indicating the location of all fire hydrants, sprinkler systems and standpipe systems provided with reclaimed water.

(7) Where there is the reasonable potential for worker or public exposure to aerosols generated in the use, Users of Category 1 Reclaimed Water (if allowed for the use per Table A) or Category 2 Reclaimed Water shall employ measures to prevent the frequent exposure of workers and the public to aerosols generated in the use of reclaimed water. Measures shall include at least one of the following: minimum setback distance of 100 feet between the nearest source of aerosol generation and areas where workers or the public are normally present; physical barriers between aerosol sources and humans; personal protective equipment to prevent aerosol inhalation; functionally equivalent measures approved by a qualified individual (e.g., a certified industrial hygienist); or other means approved by the Division. Given the higher level of treatment provided for Category 3 Reclaimed Water, additional measures to address exposure of workers or the public to aerosols are not required.

84.9 CONDITIONS FOR USE OF RECLAIMED WATER

(A) Landscape Irrigation Users and Agricultural Irrigation Users shall include the following in a User Plan to Comply:

(1) User information including name of entity; legally responsible person's name; address; telephone number; email address; and site address where reuse water will be used;

(2) An 8.5" x 11" or an 11" x 17" map or schematic drawing indicating the specific area(s) where irrigation with reclaimed water will take place;

(3) A description of the best management practices the user intends to implement to ensure that direct and windblown spray and other means of human exposure from irrigation systems will be confined to the areas designated and approved in the Notice of Authorization;

(4) Best management practices the user intends to employ to ensure that application rates shall be controlled to strictly minimize ponding and runoff and to minimize the amount of applied water and associated pollutants that pass through the root zone of the plants to be irrigated (e.g., rain shutoff devices, application at evapotranspiration rates adjusted for irrigation efficiency, daily inspections, or other means); and

(5) If applicable, information demonstrating how the user will restrict access to landscaped areas where Category 1 reclaimed water is to be applied either by:

a) Irrigating only during periods approved in the Notice of Authorization so as to strictly minimize public contact with reclaimed water, or

b) Installing barriers to prevent public access to the site, as approved in the Notice of Authorization, restricting irrigation to times when the barriers are in place, and ceasing irrigation at least one hour prior to the barriers being totally or partially removed.

(6) For Resident-Controlled Landscape Irrigation, unless a homeowners' association or other entity acceptable to the Division assumes responsibility, the treater shall be responsible for all information required in the User Plan to Comply and shall act as the users' legal representative for purposes of certification pursuant to section 84.9(D) below.

(B) Commercial, industrial, and fire protection Users shall include the following in a User Plan to Comply:

(1) User information including name of entity; legally responsible person's name; address; telephone number; email address; and site address where reuse water will be used;

(2) A description of how reclaimed water is to be used;

(3) An 8.5" x 11" or 11" x 17' map or schematic showing where such use will occur;

(4) The potential for public contact with reclaimed water used in the commercial or industrial operation(s) or process(es);

(5) The fate of waste water streams from the commercial or industrial operation or process after use (e.g., discharge to sanitary sewer, lined evaporation/recovery pond, subsequent permitted discharge, or other location);

(6) Best management practices the user intends to implement to prevent or minimize direct and windblown spray and other pathways of human exposure to reclaimed water;

(7) If applicable, information demonstrating how the user will restrict access to commercial or industrial areas, operations or processes where Category 1 reclaimed water is to be used; and

(8) Where reclaimed water is used to supply a fire sprinkler or standpipe system, information describing the user's cross-connection control, prevention and identification program that the user will implement to prevent any cross-connection between the reclaimed water and potable water systems.

(C) All users shall include information in their User Plan to Comply that demonstrates compliance with the following:

(1) Use of reclaimed water shall be confined to the authorized use area, operation, or process.

(2) Precautions shall be taken to ensure that reclaimed water will not be sprayed on any facility or area not designated for application such as occupied buildings, domestic drinking water facilities, or facilities where food is being prepared for human consumption.

(3) Notification shall be provided to inform the public that reclaimed water is being used and is not safe for drinking. The notification shall include posting of signs of sufficient size to be clearly read in all use areas, around impoundments, and on tanks, tank trucks and other equipment used for storage or distribution of reclaimed water, with appropriate wording in the dominant language(s) expected to be spoken at the site.

(4) All new, modified, or replaced piping, valves, controllers, outlets, and other appurtenances, including irrigation systems and any equipment used for fire protection or in a commercial or industrial operation or process, shall be marked to differentiate reclaimed water from potable water or other piping systems.

(5) An approved backflow prevention device or cross-connection control method shall be provided at all potable water service connections to reclaimed water use areas.

(6) Operation of the irrigation system, including valves, outlets, couplers, and sprinkler heads, and commercial or industrial facilities and equipment utilizing reclaimed water, shall be performed only by personnel authorized by the user and trained in accordance with subsection 84.9(C)(10).

(7) Supplementing reclaimed water with potable water by a user shall not be allowed except through an approved reduced pressure principle backflow prevention device or an air gap. Where a backflow prevention device is used it must be tested on an annual basis by a Certified Cross-Connection Control Technician, unless there is a physical separation (e.g., removal of the connecting pipe, etc.) between the potable and reuse distribution systems.

(8) Supplementing reclaimed water with water from irrigation wells or industrial wells shall not be allowed except through an approved reduced pressure principle backflow prevention device or an air gap.

(9) There shall be no impoundment or irrigation of reclaimed water within 100 feet of any well used for domestic supply unless:

(a) In the case of an impoundment, the impoundment is lined with a synthetic material with a permeability of 10^{-6} cm/sec or less; or

(b) In the case of irrigation, other precautions are implemented and included as a condition of the Notice of Authorization, to prevent contamination of the well.

(10) Workers shall be informed of the potential health hazards involved with contact or ingestion of reclaimed water and shall be educated regarding proper hygienic procedures to protect themselves.

(11) The additional conditions included in section 84.8, as applicable.

(D) Each User Plan to Comply shall include a statement signed by the user, or a legal representative of the user, that certifies:

(1) The user has been provided a copy of this regulation and agrees to comply with the applicable requirements of this regulation, in particular the Conditions for Use of Reclaimed Water described in sections 84.8 and 84.9, and, if applicable, the access restrictions when Category 1 reclaimed water is used. The user shall submit a certification statement per section 84.13 of this regulation with the information provided in this item; and

(2) The user agrees to allow the treater or the Division reasonable access to the site to determine whether the user is in compliance with this regulation, and/or to perform monitoring and analysis as may be required in section 84.10.

84.10 MONITORING, RECORD KEEPING AND REPORTING

(A) Treaters and users operating pursuant to a Notice of Authorization shall be subject to such monitoring, record keeping, and reporting requirements as may be reasonably required by the Division to ensure compliance with the requirements of this regulation, including, but not limited to the following:

(1) For treaters: the quality of reclaimed water produced and delivered at the point(s) of compliance, inspections of a representative number and type of user sites to determine user compliance, and self-certifications submitted to the treater by users.

(2) For each user, the total volume of reclaimed water used per year. For Landscape Irrigation Users and Agricultural Irrigation Users, each location with the associated acreage where reclaimed water was applied.

(3) For each user using Category 1 reclaimed water, confirmation that reclaimed water was used only during authorized use times (if applicable).

(B) Treaters shall provide an annual report to the Division for the previous year, by ~~January~~March 31st, that includes the following:

(1) Information demonstrating the treater's compliance with the reclaimed water standards, including applicable treatment requirements described in section 84.7 of this regulation.

(2) Confirmation that the treater conducted inspections pursuant to section 84.10(A)(1) above.

(3) Violations of this regulation by users pursuant to section 84.10(C)(1), below.

(4) A certification statement by the treater as per section 84.13 below regarding the information provided by the treater in subsections (1) and (2) above.

(5) Information supplied by users to the treater demonstrating compliance with the conditions applicable to each specific user included in the Notice of Authorization.

(6) Certification statements from each user as per section 84.13 below regarding the information provided in subsection (5) above.

(C) The treater and users shall report any violations as follows:

(1) Violations of this regulation and/or Notices of Authorization at their respective facilities in writing to the Division, within thirty days of becoming aware of the violation. Where the treater finds violations by a user, the thirty day period for reporting is waived for a period of up to thirty additional days, if the treater is working with the user to resolve the violation. If the violation is resolved, no separate notice to the Division is required except that the violation is to be reported in the treater's annual report. If the violation is continuing after a total of sixty days from the time the treater became aware of the violation, the treater shall report the violation to the Division within five working days. Nothing in this section precludes a user from reporting violations by a treater to the Division.

(2) For more serious violations (including non-permitted discharges to surface waters, uncontrolled cross-connections, exceedences of the reclaimed water standards for *E. coli*, or other violations posing an immediate threat to public health or the environment): orally to the Division within 24 hours of becoming aware of the violation, followed up by a

written report within five working days. The written report shall contain a description of the noncompliance, including exact dates and times; and steps taken or planned to reduce, eliminate, and prevent recurrence of the noncompliance.

84.11 VARIANCES

The Division may grant a variance from any provision of this regulation, except that with respect to the *E.coli* standards in section 84.7, a variance may only be granted from the "235/100 ml single sample maximum" standard. The Division may grant a variance in a particular case where the treater or the user demonstrates that the benefits to public health or the environment that will be created by compliance with the subject provision do not bear a reasonable relationship to the costs required to achieve compliance.

84.12 ENFORCEMENT

Violations of this regulation by treaters and users shall be subject to enforcement by the Division pursuant to Part 6 of the CWQCA. A treater shall not be subject to enforcement for a violation by a user; a user shall be solely responsible for its compliance with the terms and conditions imposed upon users. However, if the treater was aware of a violation by a user and did not report it as required in subsection 84.10(C), the treater may be subject to an enforcement action for failure to report the violation. A user shall not be subject to enforcement for a violation by a treater; a treater shall be solely responsible for its compliance with the terms and conditions imposed upon treaters. However, if a user was aware of the violation and did not report it as required in subsection 84.10(C), the user may be subject to an enforcement action for failure to report the violation.

84.13 CERTIFICATION

Persons who are required to make submittals pursuant to subsections 84.6(A)(5), 84.9(D), and 84.10(B) of this regulation, shall include the following certification statement:

"I certify, under penalty of law, that the information I am providing in this submittal is true, accurate, and correct. This determination has been made under my direction and supervision in accordance with a system designed to ensure that qualified personnel properly gather and evaluate the information. I am aware that there are significant penalties for false certification including the possibility of fine and imprisonment."

84.14 - 84.20 Reserved

84.21 STATEMENT OF BASIS, SPECIFIC STATUTORY AUTHORITY, AND PURPOSE

The provisions of sections 25-8-205(1) and 25-8-308(1)(h) C.R.S., provide the specific statutory authority for the Reclaimed Domestic Wastewater Reuse Control Regulation adopted by the Commission. The Commission has also adopted, in compliance with section 24-4-203(4), C.R.S., the following statement of basis, specific statutory authority, and purpose.

BASIS AND PURPOSE

A. Background

In March of 1998 the Commission requested that a subcommittee of the Water Quality Forum be convened to consider potential statutory changes to the Colorado Water Quality Control Act ("Act") to address reuse of reclaimed domestic wastewater for landscape irrigation. The joint reuse committee of the American Waterworks Association and the Water Environment Association ("AWWA/WEA") suggested this approach to the Commission in a February 1998 presentation.

In the fall of 1999 the Forum subcommittee made a recommendation that the Colorado Water Quality Control Act be amended to provide the Commission with the authority to promulgate control regulations for the oversight of reuse and to provide the Division with the authority to implement a reuse program. In March of 2000 the general assembly adopted changes to the Act consistent with the subcommittee's recommendations and those changes became effective on July 1, 2000. The subcommittee had been concurrently working on a proposed control regulation that is patterned after the Commission's Biosolids Regulation.

B. Regulatory System Overview

It is the intent of the Commission that this regulation further promote reuse of reclaimed domestic wastewater by providing a comprehensive framework which, when followed, will assure responsible management of operations and a product of a quality compatible with the state's goals of protecting the public health and the environment. The Commission concludes that the provisions of this regulation are economically reasonable considering the economic, environmental and public health costs and impacts of the program.

The Commission, in adopting these regulatory provisions, has limited the scope of the regulation to reuse of reclaimed domestic wastewater for landscape irrigation. The statutory changes do not, on their face, appear to limit the adoption of control regulations to this type of reuse. However, the Commission finds that it is appropriate to limit the scope of the regulation to this aspect of reuse based on the AWWA/WEA recommendation that landscape irrigation should be addressed first as the vast majority of reclaimed domestic wastewater in Colorado is used for this purpose. The Commission will consider regulatory proposals for other types of reuse, such as industrial and agricultural, in future rulemaking hearings where recommendations from a broad spectrum of interests are brought forward. This regulation is not intended for single family residential areas, unless the landscape irrigation areas are commonly owned or otherwise subject to reasonable controls by a neighborhood association to assure application is consistent with the "Conditions for Application" requirements.

The Commission has adopted provisions for the application of reclaimed domestic wastewater at "agronomic rates" with the intent that, once conforming changes are made to the Colorado Discharge Permit System ("CDPS") Regulations, reuse of reclaimed domestic wastewater in accordance with the provisions of this regulation will not be required to obtain a CDPS ground water discharge permit. The Commission does not intend that these regulations be used to limit flexibility to apply additional nutrients to landscaping being irrigated with reclaimed domestic wastewater. The Commission does expect that treaters will, as part of their overall program, inform applicators of the nutrient content of the reclaimed domestic wastewater.

The Commission has found that the use of an approach similar to that defined in the Biosolids Regulation will provide the appropriate level of oversight of reuse operations yet will not unduly burden the entities that are treating and applying reclaimed domestic wastewater to landscape.

The Commission expects that the amount of available information both on the health effects of reclaimed domestic wastewater and on the monitoring of pathogens will increase over the next several years. As a result, the Commission anticipates that the standards may be adjusted as new information becomes available. In the triennial review of this regulation, the Commission will consider any new information that is brought to it concerning pathogenic microorganisms and indicators of the presence or absence of such microorganisms in reclaimed domestic wastewater.

C. Letters of Intent

In order to facilitate the use of reclaimed domestic wastewater the "treater" is required to submit a Letter of Intent for each "applicator" to which it will be supplying reclaimed domestic wastewater. This will add a marginal burden to the treater, the entity that is most knowledgeable of the operational and regulatory requirements of the regulation, and will facilitate the responsible use of reclaimed domestic wastewater by entities that are interested in obtaining a viable product. At the same time, the Commission recognizes

that the applicator must take responsibility for the proper use of reclaimed domestic wastewater by requiring the applicator to acknowledge receipt of the regulation and their intent to comply therewith. The treater must submit a description of an educational program that, in combination with a proposed plan to oversee the applicator's operation, will provide reasonable assurance of compliance.

The Commission has allowed existing treatment and land application facilities until December 31, 2001, to submit Letters of Intent as they will continue to be regulated under an existing discharge permit. This will give these systems ample time to obtain the required information from their applicators and to develop any additional information on their own facilities. New operations are required to submit Letters of Intent at least 30 days prior to the use of reclaimed domestic wastewater for landscape irrigation. This difference in timing is appropriate as existing facilities have been operating under a different set of regulatory requirements while new operators will be made aware of the requirements of these regulations through the site application approval process for domestic wastewater treatment works.

The Commission has established a 30-day period during which the Division must notify the applicant if the Letter of Intent is incomplete. This period is long enough to allow the Division to complete its review of the application and will not unreasonably delay approval of new systems or the addition of new applicators to existing systems.

D. Notices of Authorization

The Division has an additional 30 days from the time that the Letter of Intent is determined to be complete to issue the Notice of Authorization. This Commission finds this to be reasonable amount of time as the treater will have already received approval of the site application for the treatment facilities such that a substantial amount of information regarding the system will have already been provided to the Division. The Commission has required a Notice of Authorization to be issued to the treater and each applicator as a means of ensuring that the burden of compliance with the regulations is fairly distributed between the entity providing the reclaimed domestic wastewater and the entity that is putting that water to use.

The Commission has provided the opportunity for the treater, an applicator, or any other aggrieved party to appeal the Division's decision to issue or deny a Notice of Authorization in accordance with the Commission's procedural regulations.

The Commission has not limited the effective period of the Notice of Authorization since changes other than the addition or removal of applicators are expected to be relatively infrequent. This will reduce the burden that renewing Notices of Authorization would have on both the treater/applicator and the Division.

Notices of Authorization will include appropriate monitoring and reporting requirements, reclaimed domestic wastewater standards, and other necessary conditions to ensure the protection of the environment and public health.

E. Reclaimed Domestic Wastewater Standards

Treatment Requirements and Technology-Based Limits

The public health risk of contracting disease from pathogenic microorganisms via exposure to reclaimed domestic water is mitigated by treating wastewater so as to minimize the number of viable pathogenic microorganisms: bacteria, viruses and protozoans. Acceptable public health risk is determined based on an absence of acute gastrointestinal disorders [the most likely type of disease manifestation] in those persons casually exposed to reclaimed domestic wastewater as it is used for surface irrigation of landscaping. Bacterial protection is ensured through the imposition of limits on E.coli, a surrogate organism for determining the potential presence of bacterial pathogens. Viral and protozoan (meaning specifically enteroviruses, and giardia/cryptosporidia parasites) protection is ensured by the imposition of limits for turbidity or total suspended solids, as appropriate.

The Commission has determined that, for unrestricted use of reclaimed domestic wastewater, which has a higher level of public contact, an additional barrier is appropriate to ensure the physical removal of pathogenic organisms that may potentially be present in the wastewater. Therefore, filtration, with associated turbidity limits to ensure the proper operation of the filtration facilities, is required for treaters practicing unrestricted use. Dilution after the filtration process will not provide a positive barrier to pathogenic organisms and is not allowed to be used as a means of complying with limits unless a variance has been obtained. Restricted use, with its much lower potential for public contact, will not require filtration; however, total suspended solids limits consistent with a well-operated secondary treatment system will be required.

Selection of turbidity as a surrogate measure of microbial purity for reclaimed domestic water is valid as an inexpensive means of determining microbial purity with regard to viruses and parasites. There is an absence of data to absolutely define a turbidity at or below which viruses will be absent. Actual turbidity vis-a-vis virus density data illustrate that, when combined with adequate disinfection, an absence of virus plaque forming units can be achieved up to turbidity levels of six NTU (nephelometric turbidity units). (D'Angelo, et al. Pilot Testing to Evaluate Virus Removal and Deactivation, Proceedings of the 1984 Specialty Conference on Environmental Engineering, ASCE/Los Angeles, California, June 25-27, 1984). Similarly, from 1984 to 1991, comprehensive virus testing by Dr. Gerba at the University of Arizona recovered only one plaque forming unit (virus) from the Tucson Water Department's recycled water facility which was operating with a five NTU limit with an actual turbidity averaging between 3.5 and 4.0 NTU. In addition, there are four turbidity levels used among several states that permit the use of reclaimed domestic wastewater for irrigation. A two NTU limit is used in California, Missouri, and Oregon, a three NTU limit is used in Nevada and Texas (30-day average in TX, only), and a five NTU limit is used in Tucson, Arizona. In some cases concomitant virus and parasite (specifically Ascaris lumbricoides) monitoring is required; in other cases virus or parasite monitoring is required with no attention paid to turbidity; and in one case total suspended solids limits are used instead of turbidity limits. There is no consensus among the several states as to the appropriate turbidity limit. Accordingly, the Commission has selected a middle ground for unrestricted use application of reclaimed domestic wastewater. For these systems, calendar-month-average and maximum limits will be set at three NTU and five NTU (not to be exceeded in more than 5% of samples), respectively. No turbidity limits are required for restricted use sites, however, a total suspended solids limit of 30 mg/l is required as a daily maximum. This is deemed a somewhat conservative health risk-based standard given the low potential for contact with reclaimed domestic wastewater in this circumstance. This standard is technologically achievable and the Commission finds it to be appropriate to maintain public confidence in reclaimed domestic wastewater.

Indicator Organism and Limits

The Commission finds that E.coli is the appropriate surrogate indicator organism for determining the potential presence of bacterial pathogens in reclaimed domestic wastewater. The use of E. coli is appropriate primarily based on contemporary research presented in EPA documents summarizing the scientific studies. The most recent scientific data is contained in EPA 440/5-84-002 (Ambient Water Quality Criteria for Bacteria – 1986), and Dufour's USEPA study (Dufour, A.P., 1984, Health effects criteria for fresh recreational waters: EPA 600/1-84-004). The evidence demonstrates that E.coli is the best possible indicator organism because the ratio between pathogens of fecal origin to indicator organisms is most valid for E.coli. Furthermore, E.coli does not regrow once it is released into the ambient environment, where it only survives for about 110 hours.

This is similar to pathogen survival. These criteria do not hold for the traditional indicator organisms such as total and fecal coliforms. (Cabelli, V.J., 1982, Microbial Indicator Systems for Assessing Water Quality, Antonie van Leeuwenhoek, 48:613). In August 1998 US EPA's Office of Science and Technology, on the advice of 14 experts, strongly agreed that E.coli was the only appropriate indicator of fecal contamination.

E. coli also more closely meets and fulfills the traditional and long standing requirements of a surrogate indicator organism for pathogens. These criteria are that an indicator must be a biotype that is prevalent in sewage and excreted by humans and warm blooded animals. It should be present in greater abundance than pathogenic bacteria and the indicator should not be readily capable of proliferation.

Ideally the indicator will be more resistant to disinfectants than pathogenic bacteria but will otherwise have a similar ambient survival time with them; and, the indicator should be quantifiable by simple, inexpensive, and rapid laboratory procedures. (Kott, Y., Current Concepts of Indicator Bacteria, BACTERIAL INDICATORS/HEALTH HAZARDS ASSOCIATED WITH WATER, ASTM STP 635, A. W. Hoadley and B. J. Dutka, Eds. American Society for Testing and Materials, 1977, pp 3-13.) E. coli satisfies more of these than any other indicator microorganism recommended by health professionals for fresh water.

There are few epidemiological studies that evaluate the risk of contact with reclaimed domestic wastewater. The Commission has set the limits for E. coli at a level equivalent to that recommended by EPA for swimming beaches in Ambient Water Quality Criteria for Bacteria – 1996 which recently was reaffirmed by EPA in Draft Implementation Guidance for Ambient Water Quality Criteria for Bacteria 1996 (January 2000). While these uses do not directly correlate, the Commission has found this to be an acceptable level of risk particularly when considering that, in establishing the limit for swim beaches, it was assumed that 100 ml of water was ingested. It is reasonable to expect that criteria established to protect swimmers will be more protective of individuals casually exposed to irrigation spray of reclaimed domestic wastewater.

F. Additional Conditions

The Commission is establishing a number of conditions for the application of reclaimed domestic wastewater that are intended to provide additional assurance that the health of the public will be protected by minimizing exposure to pathogenic organisms and that runoff from reuse sites will not leave the application site or enter state waters in appreciable amounts. In response to concerns raised regarding how the restricted use conditions of the regulation may be applied to use of reclaimed domestic wastewater for irrigation of golf courses, the Commission anticipates that golf course irrigation that occurs before and after normal operating hours on golf courses that restrict public access during such times will typically satisfy the requirements of subsection 84.8(A) of the regulation.

G. Monitoring and Reporting

The Commission finds that compliance oversight of the applicators should be shared by both the Division and the treater. The treater, based on its relationship with the applicator, is in a better position to oversee the operations of the applicator and can generally resolve violations without Division intervention as part of their routine program activities. If these efforts fail to return the applicator to compliance, then the Division will assume the lead role in the compliance oversight efforts.

Due to the limited part of the year during which irrigation takes place, the Commission finds that it is appropriate to limit the submittal of reported information to an annual report. The annual report must include the confirmation that the treater conducted inspections at a representative number of applicator sites as part of the treater's overall compliance assurance program.

H. Variances

The Commission is establishing a provision for variances from any aspect of the regulation but notes that the burden is on the treater to demonstrate that compliance with the regulations is unreasonable in light of the costs to comply.

The Commission recognizes that several reclaimed domestic wastewater systems were constructed and operated prior to the adoption of this regulation. This regulation is not intended to force existing systems to make capital improvements solely for assuring standardization if they accomplish the objectives of this regulation.

PARTIES TO THE RULEMAKING HEARING

1. Spring Valley Sanitation District
2. The City of Thornton
3. The City and County of Denver, Board of Water Commissioners
4. The City of Westminster
5. Roxborough Park Metropolitan District
6. Plum Creek Wastewater Authority
7. The City of Broomfield
8. The Farmers Reservoir and Irrigation Company
9. Colorado Water Conservation District
10. Colorado Springs Utilities
11. The Town of Hotchkiss
12. Spring Valley Development, Inc.
13. The City of Aurora
14. Chatfield Watershed Authority
15. The City of Blackhawk
16. Public Service Company of Colorado

84.22 STATEMENT OF BASIS, SPECIFIC STATUTORY AUTHORITY, AND PURPOSE (April 2004 Hearing)

The provisions of sections 25-8-205(1) and 25-8-308(1)(h) C.R.S. provide the specific statutory authority for adoption of amendments to the Reclaimed Domestic Wastewater Reuse Control Regulation. The Commission also adopted, in compliance with section 24-4-203(4), C.R.S., the following statement of basis and purpose.

Basis and Purpose

When the Commission adopted Regulation 84 in October 2000, it limited its scope to use of reclaimed domestic wastewater for landscape irrigation. On October 8, 2003, the Water Quality Control Division and the Joint Water Reuse Committee of the Rocky Mountain Section American Water Works Association and Rocky Mountain Water Environment Association ("RMSAWWA/RMWEA") requested that the Commission review Regulation 84 for the purpose of considering industrial and commercial uses of reclaimed domestic wastewater. On April 12, 2004, the Commission held a rulemaking hearing during which several modifications and additions to the regulation were adopted. The Commission modified section 84.4 of the regulation to clarify that reuse of reclaimed wastewater for the uses identified in section 84.8 of the regulation is prohibited except where authorized pursuant to a Notice of Authorization. This change was made to clarify the Commission's intent that regulation 84 does not preclude the Division from authorizing uses of reclaimed wastewater that fall outside of the current scope of Regulation 84, where the Division is legally authorized to do so.

As a result of this rulemaking, the Commission amended Regulation 84 to further promote the use of reclaimed domestic wastewater, by allowing such water to be used in industrial and commercial applications as well as landscape irrigation. The Commission finds that the industrial and commercial uses contemplated by these amendments will create no greater risk to public health or the environment than the landscape irrigation uses authorized before the amendments.

The regulation, as amended, provides a framework that assures these additional uses are consistent with the Commission's goals of protecting the public health and the environment, by requiring reclaimed domestic wastewater to meet minimum standards, and requiring treaters and users of such water to employ appropriate best management practices and oversee its use.

The Commission adopted provisions requiring treaters to provide the Division with a "User Plan to Comply" for each user, prior to receiving authorization to provide reclaimed domestic wastewater. The plan shall describe the intended use and the best management practices the user will employ, and

demonstrate how these practices ensure the proposed landscape irrigation, industrial or commercial use will be protective of public health and the environment.

The Commission also revised the regulation for clarity by renumbering sections, revising language, and reorganizing the regulation.

The Commission concludes that the amendments to this regulation are economically reasonable considering the economic, environmental, and public health costs and impacts of the reuse program.

Section 84.2 was modified to clarify the Commission's intent that the regulations protect the environment as well as public health. Section 84.4 was revised to expand Regulation 84's applicability for reclaimed domestic wastewater and to remove obsolete references. Section 84.4 was also revised to replace the term "direct reuse" with "reuse," as the exceptions provisions in section 84.4 already exempt waters discharged to state waters from coverage under Regulation 84. Language was also added to section 84.4 to clarify that treaters and landscape irrigation users who are operating under already existing Notices of Authorization do not need to resubmit Letters of Intent upon promulgation of these regulatory amendments. The Division will issue amended Notices of Authorization to the existing treaters and landscape irrigation users as routine amendments are made to their user information and Letters of Intent, or by June 30, 2006, whichever comes first. However, treaters and users who had implemented programs for use of reclaimed water prior to the effective date of the regulation for any use other than landscape irrigation must submit new Letters of Intent for such use(s) to the Division no later than August 31, 2004.

The Commission adopted amendments adding, deleting, and modifying definitions used in Regulation 84. The following definitions were modified or deleted to increase clarity or to achieve consistency with other revisions: "Point of Compliance," "Reclaimed Domestic Wastewater," "Restricted Use," and "Treater." The definition of "Direct Reuse" was deleted consistent with the change to section 84.4 noted above. The definition for "Applicator" was deleted and replaced with a more generic definition of "User" to include all types of users of reclaimed domestic wastewater. The following definitions were added: "Commercial User" describes a new type of user; "Industrial User" describes a new type of user; "Irrigation System" reduces confusion by differentiating between a user's irrigation system and a treater's treatment and transmission facilities; "Landscape Irrigation User" aids in differentiating between types of users; "Restricted Access" is used in place of "restricted use" for clarity; "Transmission System" reduces confusion by differentiating between a treater's facilities and a user's irrigation system; "Unrestricted Access" is used in place of "Unrestricted Use" for clarity; "User" describes the characteristics of users; and "User Plan to Comply" refers to the plan a user is required to submit to show compliance with Regulation 84.

The Commission reorganized and edited section 84.6(a) [formerly 84.5(A)] regarding letters of intent, for clarity, completeness, and consistency with other revisions. Treaters must still submit a Letter of Intent to the Division, but the Letter of Intent requirements differ, depending on the intended uses for the reclaimed domestic wastewater. In addition, the Commission recognizes that to facilitate new or expanded uses for reclaimed domestic wastewater and timely approval of projects, the Division must have some flexibility in administering the Letter of Intent process. For instance, the revisions would allow a treater to submit a Letter of Intent concurrently with a pending site application and/or facility plans and specifications.

The Commission amended subsection 84.6(A)(3) [formerly 84.5(A)(3)], to clarify that treaters are required to provide information demonstrating that reclaimed domestic wastewater applied to landscapes by landscape irrigation users will be applied at or below agronomic rates or, where application at agronomic rates is not or will not be achieved, that land application is being done pursuant to a CDPS permit. The Commission is aware that some entities may have been land applying in excess of agronomic rates, and that they have incorporated the return rates to ground water into their discharge permits and into augmentation plans. The Commission adopted this change to provide flexibility to entities practicing landscape irrigation so that they can maintain their current application practice, and associated credits under their augmentation plan, while applying reclaimed water in excess of agronomic rates pursuant to a CDPS permit. The Commission added language indicating that land application may also be subject to

waste load allocations or limits as contained in a TMDL or control regulation governing the watershed within which the land application occurs, to clarify that Regulation 84 acts in tandem with these regulatory requirements. The agronomic application rate requirement does not apply to commercial and industrial users.

The Commission reorganized subsection 84.6(A)(6) [formerly 84.5(A)(6)] by moving existing requirements for users into modified sections 84.9 and 84.10, which contain the required content of a "User Plan to Comply" for each different type of use. The purpose of the User Plan to Comply is to provide the Division with information from each user that demonstrates that the proposed landscape irrigation, industrial or commercial use will be protective of public health and the environment.

The Commission amended subsection 84.6(A)(7) [formerly 84.5(A)(7)] to simplify the Letter of Intent process while, at the same time, fulfilling the Commission's responsibility under C.R.S. 25-8-104 to determine if any decision it makes has the potential to cause material injury to water rights.

The Commission moved the requirement that a treater must update and modify its Letter of Intent under certain circumstances to subsection 84.6(E)(7) [formerly 84.5(A)(8)] under Terms and Conditions of Notices of Authorization. The Commission inserted a requirement for the treater to include a letter from the fire protection authority indicating its approval for use of reclaimed domestic wastewater for fire protection activities. This requirement assures that the fire protection authority has been solicited. This section 84.6(E) [formerly 84.5(E)] regarding Notices of Authorizations was revised for clarity, completeness, and consistency with other revisions.

In this rulemaking, the Commission established category-based standards for reclaimed domestic wastewater quality in section 84.7 [formerly 84.6]. Category 1 standards apply to water previously designated for "restricted use," and Category 2 standards apply to water previously designated for "unrestricted use." The category framework allows the Commission to identify with more precision the appropriate uses for various qualities of reclaimed domestic wastewaters, while the terms "restricted use" and "unrestricted use" were found to be incompatible with the diverse industrial and commercial settings where reclaimed domestic wastewater is now authorized to be used. The category-based framework also will facilitate the Commission's future review of proposed uses for reclaimed domestic wastewater that may require different water quality.

The Commission found no reason to reassess the treatment standards adopted for reclaimed domestic wastewater. The Commission, in the 2000 rulemaking, found those standards to be appropriate for the use of reclaimed domestic wastewater for landscape irrigation and the Commission finds them to be sufficiently protective of public health and the environment for the additional approved industrial and commercial uses when best management practices are employed.

The Commission modified the treatment requirements for reclaimed domestic wastewater by replacing the term "oxidized" with "secondary treatment." Secondary treatment is generally accepted in the wastewater industry to mean that wastewater has been biologically treated to remove at least 85% of BOD and total suspended solids.

The Commission established a new section 84.8 to identify different approved uses for reclaimed domestic wastewater. A table is provided detailing the landscape irrigation, industrial and commercial uses approved by the Commission if such use is conducted in accordance with a Notice of Authorization under Regulation 84. Each new use is addressed below:

Cooling Tower: The Commission approved the use of reclaimed domestic wastewater in cooling towers, based on findings that indicate the quality of the source (make-up) water used in cooling towers is not of great concern. When best management practices typically applied at cooling towers are employed, the quality of the source water does not increase any risk to public health or the environment. Cooling towers are not accessible to the public and are maintained in a fashion that the water quality inside the cooling tower is controlled to standards that protect human health, regardless of the make-up water quality.

Concrete Mixing and Washout: The Commission approved the use of Category 1 reclaimed domestic wastewater in concrete batching processes where the water is mechanically dispensed into the truck mixer drum through a metal chute. This use of reclaimed domestic wastewater is protective of public health and the environment due to the fact that the water is dispensed by computer operated equipment, preventing worker contact, and the high pH of batched concrete would not allow the growth of microorganisms. Additionally, the water is entrained in the concrete and, therefore, is not discharged to surface or groundwater. Due to the potential for public and worker exposure, Category 1 reclaimed domestic wastewater may not be used for purposes other than mixing of the concrete. The Commission approved using Category 2 reclaimed domestic wastewater for batching concrete, for truck wash-down purposes at the plant, as an on-truck water supply to use for maintaining and adjusting concrete slump, and for wash-out purposes at the site. The Commission realizes that when proper BMPs are implemented, this use is protective of public health and the environment.

Dust Control/Soil Compaction/Mechanized Street Sweeping: The Commission approved the use of reclaimed domestic wastewater to wet down or pre-water work surfaces, for construction and demolition activities, sandblasting, soil compaction, and mechanized street washing. Approval is conditional on the user demonstrating that the application rate for these uses will not result in ponding or runoff into waters of the state, and that off-property transport of airborne particulate matter will be minimized. These uses are deemed protective of public health and the environment because the potential for public exposure for these activities when best management practices are implemented is minimal.

Closed Loop Cooling System: The Commission approved the use of reclaimed domestic wastewater in closed loop cooling systems where water circulates only within a contained system. This use results in no public exposure to reclaimed domestic wastewater, and only very limited and controlled contact by workers. Environmental risk from this use is also minimal when proper treatment and best management practices associated with the cooling processes are employed. Allowing the use pursuant to the best management practices, including discharging wastewater from the cooling process to the sanitary sewer system or other approved disposal mechanism, required by the regulation creates no greater risk to public health and the environment than using potable water in the cooling system.

Zoo Operations: The Commission approved the use of reclaimed domestic wastewater in zoo operations, including the care of captive animals. The Animal and Plant Health Inspection Service of the U.S. Department of Agriculture enforces the Animal Welfare Act, which governs the humane care and treatment of warm blooded and marine animals held in zoos. These entities must be licensed to operate, and must comply with the care and treatment standards provided by federal law. Category 2 reclaimed domestic wastewater meets or exceeds the water quality standards for zoo animals provided by federal law. Environmental and public health risk from this use is also minimal when proper best management practices associated with zoo management practices are employed. Such practices include discharging animal wastewater to the sanitary sewer system or other approved disposal mechanism, limited public access to water used for animal holding areas and habitat wash-down.

Fire Protection: The Commission determined that providing fire protection (interior sprinkler and exterior hydrants) with reclaimed water meeting Category 2 standards for commercial/industrial buildings is protective of public health when appropriate best management practices are implemented. The exposure to reclaimed water by building occupants during a fire is expected to be of short or no duration. This, coupled with the quality of Category 2 water, will not present a significantly greater risk than exposure to reclaimed water in a park or other landscape irrigation setting. Risks to fire fighters will be further mitigated due to their use of personal protective equipment and the requirement that they be educated in proper use of reclaimed water. Due to an increased risk of cross connection and potentially greater risk to public health, the Commission is not at this time specifically permitting the use of reclaimed water for hydrants in residential neighborhoods or for fire sprinkler systems at any residential structure. However, the Commission understands that the ability to use reclaimed water for such residential firefighting uses may have ramifications for both the costs associated with the construction of, and the need for, “potable” water facilities. The Commission believes, however, that such concerns can be addressed through the use of the variance provisions at section 84.12, whereby the Division can allow such uses on a case-by-case basis, subject to the proponent providing a quality of reclaimed water better than Category 2, and

implementing additional BMPs that ensure the impact to public health and the environment are appropriately limited.

Where reclaimed water is used at interior sprinklers, with numerous fire protection outlets, there are increased risks of public exposure to reclaimed water during non-emergencies and for cross connections between the reclaimed water and potable water systems. The Commission is requiring that the additional conditions listed in section 84.8(A)(7) be implemented to strictly minimize these risks.

Water used for firefighting typically becomes polluted during its use. The Commission finds that there is little increased environmental risk associated with the reclaimed water source versus a potable water source for the firefighting water. Due to the emergency nature and low frequency of occurrence, discharges from firefighting activities are exempt from NPDES permitting requirements for non-storm water discharges (40CFR Part 122, §122.26) and shall likewise be exempt from the 'no discharge to waters of the State' provision in section 84.4 of this Regulation.

The Commission reorganized and edited section 84.9 [formerly 84.7] to address conditions for each different type of use of reclaimed domestic wastewater. Users must address each condition in a "User Plan to Comply" which varies for each type of use. (Under section 84.6, a treater must submit a User Plan to Comply for each of its users, certify that it will implement its Reuse Management Plan, and monitor the user's compliance with the User Plan to Comply and the requirements of Regulation 84.) Industrial and commercial users must submit a User Plan to Comply that describes the industrial or commercial operation or process using reclaimed domestic wastewater, an analysis of the specific use's potential risks to public health and the environment, and best management practices the user will employ to minimize such potential risks. The User Plan to Comply also includes a certification by the user that its use of reclaimed domestic wastewater is consistent with Regulation 84's purpose of protecting public health and the environment.

Modifications to this section include the following:

- 84.9(A) sets forth the conditions for the application of reclaimed domestic wastewater for landscape irrigation.

- 84.9(B) is a new section setting forth the conditions for industrial and commercial users.

- 84.9(C) sets forth conditions for use applicable to all users, regardless of type. Each of these conditions previously applied only to landscape irrigation users. [formerly 84.7(A)(1), 84.7(A)(2), 84.7(A)(3), 84.7(A)(4), 84.7(C), 84.7(E), 84.7(F), 84.7(G), 84.7(H), 84.7(I), 84.7(J), 84.7(L) and 84.7(M).]

- Former Section 84.7(D) required users to comply with the piping design guidelines contained in AWWA Manual M-24, Dual Water Systems, (AWWA, Denver, CO 1994). This reference was eliminated because the referenced guidelines are not applicable to users' irrigation, industrial and commercial piping systems. Section 84.6(A)(2) of the amended regulation requires the treater to submit proof it has obtained site application approval and design approvals pursuant to the requirements of Regulation No. 22. Treaters' location and design plans and specifications are reviewed by the Division pursuant to Regulation No. 22. It is the intent of the Water Quality Control Division to use AWWA Manual M-24 as guidance during this review.

Section 84.10 [formerly 84.8], which establishes additional conditions for the use of Category 1 reclaimed domestic wastewater, was revised for clarity, completeness, and consistency with other revisions.

The Commission revised section 84.11 [formerly 84.9] to account for industrial and commercial uses, and to eliminate previous monitoring requirements that were impractical and burdensome for treaters and users. Users of Category 1 reclaimed domestic wastewater for landscape irrigation must confirm that application occurred during authorized times instead of requiring the keeping of records showing the

actual dates and times that restricted use water was used. This requirement saves time for the treaters, users and the Division while maintaining the original intent.

Section 84.12 [formerly 84.10] was revised for clarity, completeness, and consistency with other revisions. Section 84.13 [formerly 84.11] regarding enforcement was revised for clarity, completeness, and consistency with other revisions.

PARTIES TO THE RULEMAKING HEARING

1. Rangeview Metropolitan District
2. Colorado Wastewater Utility Council
3. The City and County of Denver, Board of Water Commissioners
4. The City of Westminster
5. Airpark Metropolitan District
6. Parker Water and Sanitation District
7. RG Consulting Engineers
8. Xcel Energy
9. Colorado Rock Products Association

84.23 STATEMENT OF BASIS, SPECIFIC STATUTORY AUTHORITY, AND PURPOSE (AUGUST, 2005 HEARING, ADOPTED OCTOBER 11, 2005 AND EFFECTIVE NOVEMBER 30, 2005)

The provisions of sections 25-8-205(1) and 25-8-308(1)(h) C.R.S. provide the specific statutory authority for adoption of amendments to this regulation. The Commission also adopted, in compliance with section 24-4-203(4), C.R.S., the following statement of basis and purpose.

Basis and Purpose

On February 14, 2005, the Water Quality Control Division and the Joint Water Reuse Committee of the Rocky Mountain Section American Water Works Association and Rocky Mountain Water Environment Association ("Joint Committee") requested that the Commission review Regulation No. 84 for the purpose of considering additional uses of reclaimed water and other changes to the regulation. On August 8, 2005, the Commission held a rulemaking hearing during which several modifications and additions to the regulation were adopted.

As a result of this rulemaking, the Commission amended Regulation No. 84 to continue to promote the use of reclaimed water. The regulation, as amended, extends its framework to include additional uses or reclaimed water and accompanying requirements to ensure protection of public health and the environment. Specifically, the Commission is requiring reclaimed water to meet minimum standards commensurate with the risks associated with the new uses. Also, treaters and users are required to employ appropriate best management practices and to oversee the use of reclaimed water for such uses.

The Commission concludes that these amendments to Regulation No. 84 are reasonable considering the economic, environmental, and public health costs, benefits and impacts of the water reuse program.

The term "reclaimed domestic wastewater" was changed to "reclaimed water" throughout the Regulation. "Reclaimed water" is the term used in the water reuse regulations of most other states and is also used in EPA's 2004 Guidelines for Water Reuse. It is desirable to use a common term for this highly treated water as this will assist with public education efforts.

The Commission modified section 84.4 to delete provisions that are no longer applicable and relocated the exemption for irrigation at wastewater treatment facilities to the definition of Landscape Irrigation. The Commission also added, deleted, and modified definitions to increase clarity and to achieve consistency with earlier revisions to this regulation and with other regulations. The definition of "Agricultural Use" was deleted since the regulation does not address this use at this time. The definition of "Agronomic Rate"

was expanded to include watering requirements of plants in order to reinforce the Commission's intent that passage of nutrients below the root zone be strictly minimized. This change operates in conjunction with revisions to sections 84.6(A)(3) and 84.9(A)(4). Specific uses such as Closed Loop Cooling System, Dust Control, and Fire Protection – Non Residential were deleted from section 84.8(A) and are now defined in section 84.5. The definition of "Closed Loop Cooling System" added to Section 84.5 parallels the language currently found in section 84.8(A)(5) of the rule. It is the Commission's intent that all types of closed loop cooling systems falling within this definition are authorized to use reclaimed water. This includes re-circulating evaporative cooling systems and associated cooling water storage facilities that may be employed in the electric generation industry where public access is not allowed such as the use that has been in place at Platte River Power Authority since 1981. Definitions for "Resident-Controlled Landscape Irrigation" and "Fire Protection – Residential" were also added. For purposes of this regulation, residential areas are land use planning areas zoned for residential use, or otherwise designated for residential use by the applicable local land use planning authority.

The Commission revised section 84.6(A)(3) to require a specific analysis, prior to issuance of a Notice of Authorization, to demonstrate that reclaimed water will be applied at agronomic rates. This was done to ensure that land application done under Regulation No. 84 is protective of ground water quality in light of the Commission's adoption of revisions to Regulation No. 61 that provide an exemption from the requirement to obtain a discharge permit, in such situations. Similarly, the Commission revised the best management practice at section 84.9(A)(4) to add additional protections for ground water.

In situations where there are applicable limitations on concentration or loading of phosphorus or nitrogen under a control regulation or TMDL, the Commission modified sections 84.6(A)(9) and 84.6(E)(6) to provide an option, at the request of the treater, to have such limitations addressed in the Notice of Authorization. Otherwise, such limitations must be included in a discharge permit issued pursuant to Regulation No. 61.

The Commission refined section 84.6(E)(7) regarding the requirement for a treater to request an amendment to the Notice of Authorization.

The Commission adopted standards and other requirements for Category 3 reclaimed water to apply to two newly authorized uses of reclaimed water. Specific Category 3 uses authorized include the use of reclaimed water for fire protection in residential areas and for landscape irrigation where a single-family resident has control of the plumbing and/or the time of irrigation. When compared with those uses where Category 1 or Category 2 reclaimed water is allowed, uses requiring Category 3 water may present an increased risk of consumption of reclaimed water due to the fact that the number of entities (e.g., single family residents) who control connections after initial construction will significantly increase and these individuals will also control the time and manner in which irrigation takes place. This increases both the possibility of a cross-connection between the reclaimed water and potable water systems and the risk of public contact with reclaimed water. Given this increased risk, the Commission adopted a standard for Category 3 reclaimed water that requires that *E. coli* not be detected in 75% of samples collected in any 30-day period, with a single-sample maximum for *E. coli* of 126 colony forming units (cfu) per 100 milliliters (ml) or a most probable number (MPN) of 126 per 100 ml, depending upon the analytical enumeration method used. This standard recognizes that it is not practical to meet a no detect standard for an indicator organism at all times and is consistent with regulatory requirements used in other states (e.g. Florida) and with the recommendations of the EPA. The rationale for selecting 126 cfu (or MPN) per 100 ml as the single sample maximum standard is consistent with the rationale supporting the *E. coli* standard for Category 1 and 2 reclaimed water. The Commission found that the *E. coli* standard is protective of the public health and environment where Category 3 reclaimed water is used in a manner compliant with the other requirements contained in the regulation.

The Commission exercised its discretion, pursuant to Citizens for Free Enterprise v. Department of Revenue, 649 P.2d 1054 (Col. 1982) to adopt these requirements based upon policy considerations about the possible increased risks to public health associated with the Category 3 uses as opposed to specific scientific evidence to that effect.

In addition to compliance with the *E. coli* standard, treaters and users of Category 3 reclaimed water are required to develop and implement appropriate additional best management practices, including public education, to strictly reduce the risk of cross-connections between the reclaimed water and potable water systems. Additional conditions required for Category 3 uses are listed in sections 84.8(A) and 84.9(A).

As revised, section 84.8(A) requires that at a minimum, the numbered conditions indicated in the last column of Table A are required for the corresponding uses. In addition, in accordance with the authority provided in section 84.6(E), the Division may require additional conditions listed in section 84.8(A) for individual reuse activities as it determines appropriate.

The Commission decided not to include specific requirements for continuous disinfection of Category 3 reclaimed water but notes that the requirements for monitoring to determine the quality of all categories of reclaimed water should include frequent determinations to assure that disinfection is being provided prior to use.

The Commission deleted section 84.10 and added provisions to section 84.9(A)(5) regarding the mechanisms that users of Category 1 reclaimed water must employ to restrict access to areas when irrigation is taking place.

In order to avoid the need to commit an excessive amount of Division resources for regulatory oversight when Category 3 reclaimed water is used, section 84.9(A)(6) requires the treater to assume responsibility for the numerous residential users inherent when reclaimed water is used for resident-controlled landscape irrigation and there is not an acceptable entity (e.g., homeowners' association) to assume said responsibility.

The Commission moved the provisions of section 84.11(C) to subsection (B) of new section 84.10 and also added a specific requirement to report violations pursuant to new section 84.10(C)(1).

At the time the Commission initially adopted the Variance provision in Section 84.12, it excluded authorization to the Division to provide a variance for the *E. coli* standards. The Commission now concludes that it is appropriate to provide a variance from the "235/100 ml single sample maximum"standard on a case-by-case basis. For example, testimony was received from the City of Fort Collins and the Platte River Power Authority concerning a use that has been in effect since 1981 without incident. Some of the effluent from the city's Drake facility is pumped 27 miles in an underground pipeline for ultimate addition to Platte River's 16,000 acre foot, 500 surface acre long term carryover storage reservoir for recirculating cooling water use at the Rawhide energy station. There is no public access to any part of the process and as a result, there is no public exposure to reclaimed water and potential worker exposure is adequately limited and controlled with safety procedures and best management practices. To avoid the necessity for capital and operational costs for investments associated with meeting the single sample maximum standard in the regulation, Fort Collins and Platte River requested a limited change in the Division's authority to grant a variance from this aspect of the *E.coli* standard. When Regulation 84 was adopted in 2000, the Commission noted in its Statement of Basis that reclaimed domestic wastewater systems had been constructed and been in operation prior to the adoption of the regulation. It was emphasized that this regulation is not intended to force existing systems to make capital improvements solely for assuring standardization if they accomplish the objectives of this regulation. The Commission has determined it is appropriate to provide authority to the Division to grant a variance from the single sample maximum standard when it concludes that the cost of compliance does not bear a reasonable relationship to the environmental or public health benefits.

As noted in the Statement of Basis when the Commission added *E.coli* to the Basic Standards for Surface Waters in 2000, there is great variability in individual bacteriological samples because bacteria are not uniformly distributed in water samples. A single sample may give a false impression of potential risk of violation of a standard based on a geometric mean. In cases where there is limited or no public exposure and potential worker exposure is controlled by best management work place standards, the resulting lower risk warrants the option for the Division to consider a variance from the single sample maximum standard.

The Commission also corrected references to "E coli" in Regulation No. 84 to the italicized *E coli*.

PARTIES TO THE RULEMAKING HEARING

1. RMWEA/RMSAWWA Water Reuse Joint Committee
2. Platte River Power Authority
3. Plum Creek Wastewater Authority
4. Dominion Water & Sanitation District
5. Eastern Adams County Metropolitan District
6. The City of Aurora
7. Xcel Energy

84.24 STATEMENT OF BASIS, SPECIFIC STATUTORY AUTHORITY, AND PURPOSE (August, 2007 Hearing)

The provisions of sections 25-8-205(1) and 25-8-308(1)(h) C.R.S. provide the specific statutory authority for adoption of amendments to this regulation. The Commission also adopted, in compliance with section 24-4-203(4), C.R.S., the following statement of basis and purpose.

Basis and Purpose:

Regulation 84.4 was amended to state that wastewater that has been treated and is used at a domestic wastewater treatment plant (DWWTP) site for landscape or process uses is not subject to Regulation 84. Landscape irrigation with treated effluent at a DWWTP was previously excluded in the definition of landscape irrigation. Section 84.5(10). This exclusion was deleted from the definitions section and moved to the applicability section 84.4, together with a new exclusion dealing with process waters used at a DWWTP site. The Commission believes it is more logical to include these exclusions in the section dealing with applicability.

The Commission found that it is appropriate to exclude process water used at a DWWTP site because process water uses are restricted to the DWWTP site and access to these sites is restricted and not open to the public. The use of process water is limited and controlled by DWWTP staff who are trained in the handling and use of process water. It is the Commission's intention that after the process use is completed, the process water will be captured and returned to the wastewater treatment process and not discharged separately to waters of the state.

The Commission deleted the provision in section 84.6(A)(3) that allowed landscape irrigation to be done above agronomic rates where the treater or user, as appropriate, had obtained a CDPS ground water discharge permit. The Commission understands that there are no entities currently making use of this provision and found it to be inconsistent with the original intent of Regulation 84 which was to address the use of reclaimed water under a single regulation. In addition the Commission finds, based on the typical nutrient content of treated wastewater and the watering needs of landscape plants, that application of reclaimed water at agronomic rates is achievable under normal circumstances.

84.25 STATEMENT OF BASIS, SPECIFIC STATUTORY AUTHORITY, AND PURPOSE (May, 2013 Hearing)

The provisions of sections 25-8-205(1) and 25-8-308(1)(h) C.R.S. provide the specific statutory authority for adoption of amendments to this regulation. The Commission also adopted, in compliance with section 24-4-203(4), C.R.S., the following statement of basis and purpose.

Basis and Purpose:

The use of reclaimed water has significantly increased in Colorado over the past decade and Treaters and potential Users of reclaimed water have identified an interest in new uses for reclaimed water that are not currently authorized under Regulation No. 84. Proponents from the Joint Water Reuse Committee of the Rocky Mountain Section American Water Works Association and Rocky Mountain Water Environment Association ("RMSAWWA/RMWEA") and the Colorado Section of the WateReuse Association, participating in a Water Quality Forum Work Group, requested that the Commission review Regulation No. 84 for the purpose of considering additional uses of reclaimed water.

As the Commission indicated in its initial adoption of Regulation No. 84, the use of reclaimed water is subject to Colorado water rights law. Several large municipalities have the right to use a portion of their water supply "to extinction" under Colorado law and have significant amounts of such water that are currently being discharged from the wastewater treatment facility rather than being further treated and reused.

In the 2010 triennial review for Regulation No. 84, the Commission discussed ideas that the Division and interested parties had brought forth for adopting new uses including modifying the regulation to establish broader categories of uses within which the Division could approve new uses. The Commission understands that the Division would need additional resources to implement such a scheme. However, in the interest of addressing the growing use of reclaimed water in Colorado in a timely manner, the Commission approved the renaming and addition of several specific new uses through these modifications to Regulation No. 84.

The Commission found that the following modifications to the nomenclature for authorized uses in Section 84.8 Table A are consistent with the intent of the original authorization of these uses, and presents no increase in the potential risk to human health or the environment. By modifying the nomenclature and clarifying the definition of these approved uses, similar industrial and commercial uses with similar human exposure, environmental release potential, and cross-connection potentials will be afforded the same protections under Regulation 84 and the individual Notices of Authorization issued by the Division.

- "Cooling Tower" was renamed "Evaporative Industrial Processes"
- "Closed Loop Cooling System" was renamed "Non-Evaporative Industrial Processes"
- "Dust Control", "Soil Compaction", and "Mechanized Street Cleaning" were combined and renamed "Non-Discharging Construction and Road Maintenance"
- "Concrete Mixing and Washout" was divided into two uses, "Non-Evaporative Industrial Processes" and "Washwater Applications," respectively

The Commission found that adding several new uses, with appropriate conditions placed on their use, will further facilitate the safe and efficient use of Colorado's limited water resources. The Commission approved the addition of the following Commercial Uses: Commercial Laundries, Automated Vehicle Washing, and Manual Non-Public Vehicle Washing, and a new Agricultural Irrigation use.

Evaporative Industrial Processes

The Evaporative Industrial Processes use includes, but is not limited to, the following representative applications where water is used in an industrial process where the benefit of such use requires the evaporation of water, requiring additional make-up water: cooling tower use and gas and odor adsorption. In modifying the nomenclature for this category so that it now covers multiple evaporative industrial process uses, the Commission recognized that many evaporative industrial processes have the potential to use reclaimed water instead of potable or other water supplies, with similar low potential for human exposure, releases to the environment, and cross connections. It is the Commission's intent that no

discharges to waters of the state shall be allowed with this use unless authorized via an approved permit under the Colorado Discharge Permit System (CDPS).

Non-Evaporative Industrial Processes

The Non-Evaporative Industrial Processes use includes, but is not limited to, the following representative applications where water is used in an industrial process, is not evaporated in the process, is used within a contained system, and is either discharged to a sewer system as a blow down (e.g., closed loop cooling systems) or is incorporated into a product that is not intended for personal contact or ingestion (e.g., those in which the water is retained in the product and conditions prevent excessive microorganism growth, such as the high pH of batched concrete): closed loop cooling systems (a previously-approved use, Sections 84.8 and 84.22), concrete makeup water (a previously-approved use as concrete mixing and washout, Sections 84.8 and 84.22), boiler feed water, water for lime slaking, and industrial process makeup water. In modifying the nomenclature for this category so that it now covers multiple non-evaporative industrial process uses, the Commission recognized that many industrial processes have the potential to use reclaimed water instead of potable or other water supplies, with similar low potential for human exposure, releases to the environment, and cross connections. It is the Commission's intent that no discharges to waters of the state shall be allowed with this use unless authorized via an approved permit under the CDPS.

Non-Discharging Construction and Road Maintenance

This approved use incorporates the following previously-approved representative uses for Mechanized Street Sweeping, Soil Compaction, and Dust Control. Other similar uses of water, including but not limited to cooling water for pavement cutting operations, are also authorized under this approved use. It is the Commission's intent that no discharges to waters of the state shall be allowed with this use unless authorized via an approved permit under the CDPS.

Washwater Applications

The Commission approved the new Washwater Applications use, which includes concrete washout as previously approved under Concrete Mixing and Washout. Washwater Applications would also include water used in washing of miscellaneous equipment, washing of product in mineral processing, and other similar uses where reclaimed water is used to remove material from equipment or a product. This use has been evaluated for risks to human health via ingestion, inhalation, and dermal contact. Best management practices (BMPs, specified as Additional Conditions in Section 84.8 and 84.9) and allowable water qualities are specified to mitigate these risks. It is the Commission's intent that no discharges to waters of the state shall be allowed with this use unless authorized via an approved permit under the CDPS.

Commercial Laundries, Automated Vehicle Washing, and Manual Non-Public Vehicle Washing

The Commission approved three new uses not previously authorized under Regulation 84 (Commercial Laundries, Automated Vehicle Washing, and Manual Non-Public Vehicle Washing) based upon an evaluation of the potential human health risks via ingestion, inhalation, dermal contact and cross-connection as well as the potential for discharging reclaimed water to a water of the state (groundwater or surface water). BMPs for each use and allowable water qualities were specified to minimize these risks. In assessing the proposed modifications to Regulation 84, typical uses of water in commercial laundries and automated and manual vehicle washing facilities were reviewed to characterize the likelihood and impacts of human contact with reclaimed water and releases of reclaimed water to waters of the state.

The Commission found that the potential for ingestion is negligible for all three proposed uses, in light of the limited access to the public and the commercial and industrial nature of the water use. The risk of ingestion in these new uses is further mitigated by the BMPs specified for these uses in Regulation 84. In light of the potential worker or public contact with aerosols in vehicle washing applications, the Commission considered additional information to assess the potential for human health effects of such contact. This information included the 2012 USEPA Guidelines for Water Reuse, regulations in other

states that authorize commercial laundry and vehicle washing uses, a risk assessment based on available research and literature regarding health impacts of inhalation of recycled water aerosols, and a comparison of water quality in internally-recycled vehicle washing water systems fed by potable water to the water quality of recycled water produced by an existing Treater. This indicated to the Commission that a high level of disinfection is appropriate for situations where there is a high likelihood of frequent worker contact with reclaimed water aerosols. Alternatively, BMPs should be employed to prevent frequent worker inhalation exposure if less stringent disinfection is employed.

The Commission found that:

- Secondary treatment and disinfection (Category 2 Reclaimed Water) is an appropriate treatment requirement for the use of reclaimed water in commercial laundry and vehicle washing facilities where there is no frequent worker or public exposure to aerosols generated from reclaimed water use.
- In facilities with a high likelihood of frequent worker or public exposure to aerosols generated from reclaimed water use, filtration and high-level disinfection (Category 3 Reclaimed Water) provides human health protection against aerosol inhalation risks. Alternatively, BMPs must be used to prevent the frequent inhalation of aerosols with use of Reclaimed Water Category 2.
- Effective BMPs for physically preventing frequent human contact with aerosols may include 100-foot setback distances (similar to the irrigation setback from water supply wells specified under Section 84.9(C)(9), and consistent with other states' requirements for protection of food preparation or consumption areas), physical barriers such as curtains or other means of containing aerosols to the area of generation, personal protective equipment to prevent inhalation of aerosols, or other means as may be appropriate to the site and use.

Accordingly, the Commission approved the addition of the new Additional Condition at Section 84.8(A)(7). The Commission determined that this Additional Condition is applicable to the following renamed and new uses, in consideration of the type of use and potential for frequent worker or public exposure to aerosols: Washwater Applications, Non-Discharging Construction and Road Maintenance, Non-Evaporative Industrial Processes, Commercial Laundries, Automated Vehicle Washing, and Manual Non-Public Vehicle Washing.

The Commission found the overall risk to Commercial Laundry and Vehicle Washing workers and the public associated with ingestion and dermal contact is less than swimming at a swim beach and comparable to or less than other previously approved commercial and industrial uses of Category 1, 2, and 3 Reclaimed Water. For each of these proposed uses, the Commission found the potential for cross-connecting potable and recycled water piping is similar to previously approved Commercial and Industrial uses of Category 1, 2, and 3 Reclaimed Water. The existing BMPs for cross-connection control in Regulation 84 (at 84.9(C)(5), 84.9(C)(7), and 84.9(C)(8)) will apply to these new uses as well.

The Commission approved the modification of Section 84.8(A)(3) to read "Application rates or other measures shall be employed to minimize ponding on or runoff from the area approved for application or use," and specified that this Additional Condition be required for Automated Vehicle Washing and Manual Non-Public Vehicle Washing uses. It is the Commission's intent that no discharges to waters of the state shall be allowed with these uses unless authorized via an approved permit under the CDPS.

Non-Food Crop Irrigation and Silviculture

The Commission found that the use of reclaimed water for irrigation of certain agricultural crops and trees, when implemented in accordance with the reclaimed water quality standards and BMPs established in Regulation 84, is protective of public health and the environment. Adding agricultural irrigation as an approved use of reclaimed water will encourage the expanded use of reclaimed water in Colorado and is anticipated to reduce the regulatory compliance burden on Treaters and Users by allowing them to be permitted under a single control regulation where multiple approved uses of reclaimed water are implemented.

Health risks to the public or workers associated with potential contact with reclaimed water used for agricultural irrigation were determined to be of a comparable or lower magnitude than those associated with landscape irrigation. Environmental risks associated with runoff or excessive percolation of reclaimed water to waters of the state are determined to be of a comparable or lower magnitude than those risks associated with landscape irrigation. The Commission found that there is little increased risk of cross connection associated with the use of reclaimed water versus traditional sources of water used for agricultural irrigation.

The Commission found that Category 1 water is acceptable for irrigation of those non-food crops permitted to be irrigated with reclaimed water pursuant to this Control Regulation and that the criteria for Category 1 water are generally consistent with the treatment level requirements and water quality standards adopted by several other states (e.g., Arizona, California, Florida, and Texas) and countries for the irrigation of non-food crops. The Commission found that the BMPs established for restricted access landscape irrigation are appropriate and adequate for agricultural irrigation.

Annual Report Requirements

As part of this rulemaking, the Commission also revised the annual reporting provision to revise the due date of annual reports from January 31 of each year to March 31, to allow Treaters sufficient opportunity to compile reclaimed water use data and related records from the preceding calendar year.

Proponent's Exhibit 3

PREHEARING STATEMENT

PROPONENT'S EXHIBIT 3

COLORADO WATER QUALITY CONTROL COMMISSION
STATE OF COLORADO

TESTIMONY OF THE COLORADO SECTION OF THE WATEREUSE ASSOCIATION AND THE JOINT WATER REUSE COMMITTEE OF RMWEA/RMSAWWA

IN THE MATTER OF PROPOSED MODIFICATIONS TO THE RECLAIMED WATER CONTROL REGULATION, REGULATION NO. 84

March 5, 2013

In its initial adoption of Regulation No. 84 in October 2000, the Water Quality Control Commission (Commission) expressed its intent that the regulation "further promote reuse of reclaimed domestic wastewater by providing a comprehensive framework which, when followed, will assure responsible management of operations and a product of a quality compatible with the state's goals of protecting the public health and the environment." The Commission has amended the regulation through three separate rulemaking hearings.

Like those previous amendments, the proposed changes to Regulation No. 84 for the May 2013 Rulemaking Hearing seek to further promote the beneficial and safe reuse of reclaimed water in Colorado. The new and renamed uses contemplated by these amendments will maintain the same level of public health and environmental protection as the uses previously authorized through required treatment and use of best management practices (BMPs) commensurate with the degree of risk. The revisions to Regulation No. 84 are proposed jointly by the Colorado Section of the WateReuse Association, and the Joint Water Reuse Committee of the Rocky Mountain Water Environment Association and the Rocky Mountain Section of the American Water Works Association (collectively, the Proponents).

The regulation, if amended, will continue to provide a framework that assures that the use of reclaimed water is consistent with the Commission's goals of protecting public health and the environment, by requiring Treaters to provide reclaimed water that meets minimum standards and Users of such water to employ appropriate BMPs. Furthermore, Treaters are required to oversee the use of reclaimed water by their Users. In Regulation No. 84, BMPs are specified through the Additional Conditions in Sections 84.8 and 84.9. Treaters will continue to be required to provide the Water Quality Control Division (Division) with a "User Plan to Comply" for each User prior to receiving authorization to provide reclaimed water. The plan describes the intended use and the BMPs the User will employ and must demonstrate how these practices ensure the proposed use will be protective of public health and the environment.

Also, in accordance with the authority provided in section 84.6(E), the Division may require additional conditions listed in section 84.8(A) for individual site-specific uses of reclaimed water as it determines appropriate and necessary for the protection of public health and the environment. Those additional conditions are specified in the Notice of Authorization issued specific to each User of reclaimed water.

Clarifying Revisions to Proponents' Proposal

Since submitting the Proponent's Proposal to the Commission in December 2012, the Proponents have identified a need to clarify certain provisions of the proposed language by making the following changes. Changes relative to the December 2012 submittal are identified below with underlining of new additions, and strike-through designation of deletions.

Proposed Section 84.5(1) is modified based on input from Commissioner Slutsky, with the intent of more specifically mitigating the potential for human health implications of use of reclaimed water in Agricultural Irrigation, without inadvertently affecting animals that do not produce milk for human consumption:

> Agricultural Irrigation means use of reclaimed water for the irrigation of crops and trees, excluding crops produced for direct human consumption, ~~range~~ crops where lactating dairy animals forage, and trees that produce nuts or fruit intended for human consumption.

Proposed Section 84.8(A)(7) is modified based on further input from the Proponents, to address an issue where the originally-proposed language could be interpreted to presume that aerosols would be generated in any use, rather than acknowledging that some specific uses will not generate aerosols and thus not require this BMP:

> Where there is the reasonable potential for worker or public exposure to aerosols generated in the use, Users of Category 1 Reclaimed Water (if allowed for the use per Table A) or Category 2 Reclaimed Water shall employ measures to prevent the frequent exposure of workers and the public to aerosols generated in the use of reclaimed water. Measures shall include at least one of the following: minimum setback distance of 100 feet between the nearest source of aerosol generation and areas where workers or the public are normally present; physical barriers between aerosol sources and humans; personal protective equipment to prevent aerosol inhalation; functionally equivalent measures approved by a qualified individual (e.g., a certified industrial hygienist); or other means approved by the Division. Given the higher level of treatment provided for Category 3 Reclaimed Water, additional measures to address exposure of workers or the public to aerosols are not required.

A revised version of the proposed regulation showing these revisions is attached as Exhibit 2. This includes the proposed Statement of Basis, Specific Statutory Authority, and Purpose

(SOBP) language supporting these modifications at Section 84.25. This SOBP language is unchanged from the December 2012 submittal to the Commission.

Mitigation of Risks Through Water Quality and BMPs

A description of each renamed or new use proposed for the May 2013 Rulemaking Hearing is provided below. Supporting information is provided at a higher level of detail for newly approved Commercial uses to show how the combination of required treatment and BMPs will result in protection of public health and the environment. The majority of information provided for Automated Vehicle Washing, Non-Public Manual Vehicle Washing, and Commercial Laundries is summarized from a recent study commissioned by Denver Water, as documented in the February 2013 report titled "Evaluation of Converting Vehicle Washes and Commercial Laundries to Reclaimed Water." The study examined the potential for human health and environmental exposure to reclaimed water associated with these three proposed new uses. That report is provided as Exhibit 4 to this Prehearing Statement.

<u>Evaporative Industrial Processes</u>

Under the proposal, the previously-approved Cooling Tower use will be renamed "Evaporative Industrial Processes." Evaporative Industrial Processes typically result in no public exposure to reclaimed water, and only limited and controlled contact by trained workers. The potential for ingestion of industrial process water is minimal with any source of water, including reclaimed water, due to the nature of the operations. Dermal contact potential is low, given the industrial nature of the use and the typically mechanized nature of water use and application, and/or the use of personal protective equipment. For evaporative processes, there may be the potential for inhalation of minor quantities of airborne particulates if aerosols are produced in the process. In accordance with the requirements of existing Section 84.8(A)(1), signage, supplemental disinfection, and personal protective equipment may be required if there is significant potential for personal exposure to aerosols. Furthermore, many industrial processes require the addition of chemicals to the water that present a greater hazard than the reclaimed water itself, such that personal protective equipment already in use will afford further protection against personal contact, inhalation, and ingestion of reclaimed water.

- Environmental protection for this use is afforded by proper disposal of the blow down water and use of BMPs associated with industrial processes. Reclaimed water is to be contained within the area of use and will typically be discharged to a sanitary sewer, and in some cases may be discharged to waters of the state under a discharge permit authorized by the Division. Any water that evaporates is expected to be dispersed such that no runoff or ponding will result.

- Water used in industrial processes is already subject to cross connection control and the existing cross connection control requirements of Regulation No. 84 will also apply.

Protection of human health, the environment, and cross-connections is further afforded by the existing Regulation No. 84 requirements for:

- Restrictions on area of use (84.9(C)(1), 84.9(C)(2), and 84.9(C)(9))
- Notification, signage, markings, and worker education (84.9(C)(3) and 84.9(C)(4))
- Cross-connection controls (84.9(C)(5), 84.9(C)(7), and 84.9(C)(8))
- The additional conditions included in section 84.8, as applicable.

Category 1 reclaimed water is acceptable for evaporative industrial processes based on the above and in consideration that a specific evaporative industrial process (Cooling Tower use) was already an approved use for Category 1 reclaimed water (Sections 84.8 and 84.22).

Non-Evaporative Industrial Processes

The proposal includes simplified nomenclature of two previously-approved uses of reclaimed water under a new single Approved Use titled Non-evaporative Industrial Processes. The Non-evaporative Industrial Processes use includes, but is not limited to, the following representative applications where water is used in an industrial process, is not evaporated in the process, is used within a contained system, and is either discharged to a sewer system as a blow down (e.g., closed loop cooling systems) or is incorporated into a product that is not intended for personal contact or ingestion (e.g., those in which the water is retained in the product and conditions prevent excessive microorganism growth, such as the high pH of batched concrete):

- Closed loop cooling systems (a previously-approved use, Sections 84.8 and 84.22)
- Concrete makeup water (a previously-approved use as concrete mixing and washout, Sections 84.8 and 84.22)
- Boiler feed water
- Water for lime slaking
- Industrial process makeup water

In modifying the nomenclature for this category so that it now covers multiple non-evaporative industrial process uses, it is recognized that many industrial processes have the potential to use reclaimed water instead of potable or other water supplies, with similar low potential for human exposure, releases to the environment, and cross connections.

- Non-evaporative Industrial Processes result in no public exposure to reclaimed water, and only limited and controlled contact by trained workers. The potential for ingestion of industrial process water is minimal with any source of water, including reclaimed

water, due to the nature of the operations. Dermal contact potential is low, given the typically mechanized nature of water use and application and/or the use of personal protective equipment. With Non-evaporative Industrial Uses, there is limited potential for the creation of aerosols and inhalation. In accordance with the requirements of Section 84.8(A)(7), additional measures will be required if there is potential for frequent personal exposure to aerosols. Furthermore, many industrial processes require the addition of chemicals to the water that present a greater hazard than the reclaimed water itself, such that personal protective equipment already in use will afford further protection against personal contact, inhalation, and ingestion of reclaimed water.

- Environmental protection for this use is afforded by proper disposal of the blow down water and use of BMPs associated with industrial processes. Reclaimed water will be contained within the area of use and will typically be discharged to a sanitary sewer, and in some cases may be discharged to waters of the state under a discharge permit authorized by the Division.

- Water used in industrial processes is already subject to cross connection control.

Protection of human health, the environment, and cross-connections is further afforded by the existing Regulation No. 84 requirements for:

- Restrictions on area of use (84.9(C)(1), 84.9(C)(2), and 84.9(C)(9))

- Notification, signage, markings, and worker education (84.9(C)(3) and 84.9(C)(4))

- Cross-connection controls (84.9(C)(5), 84.9(C)(7), and 84.9(C)(8))

- The additional conditions included in section 84.8, as applicable.

Category 1 reclaimed water is acceptable for non-evaporative industrial processes based on the above and in consideration that two specific non-evaporative industrial processes (closed loop cooling systems and concrete makeup water) were already approved uses for Category 1 reclaimed water.

Non-Discharging Construction and Road Maintenance

The proposal combines three previously-approved uses of reclaimed water under a new single Approved Use titled Non-Discharging Construction and Road Maintenance activities. Non-discharging construction and road maintenance is defined as the use of reclaimed water for nonpotable applications where water is required for cooling, wetting, dust suppression, or other construction and road maintenance activities, where there is no public exposure to reclaimed water under normal operations and only limited and controlled contact with reclaimed water by trained workers.

This simplification reflects the Commission's original finding that these uses have nearly identical potential for human and environmental exposure, as evidenced by their combined description in the SOBP for the April 2004 Rulemaking Hearing regarding amendments to Regulation No. 84 (Section 84.22):

> Dust Control/Soil Compaction/Mechanized Street Sweeping: The Commission approved the use of reclaimed domestic wastewater to wet down or pre-water work surfaces, for construction and demolition activities, sandblasting, soil compaction, and mechanized street washing. Approval is conditional on the User demonstrating that the application rate for these uses will not result in ponding or runoff into waters of the state, and that off-property transport of airborne particulate matter will be minimized. These uses are deemed protective of public health and the environment because the potential for public exposure for these activities when best management practices are implemented is minimal.

In approving this combination of existing Approved Uses, it is recognized that many construction and road maintenance activities have the potential to utilize reclaimed water instead of potable or other water supplies, with similar low potential for human exposure, cross-connections, and releases to the environment.

Use of water under this Approved Use is characterized by minimal intermittent potential for human exposure, as recognized by the Commission under the initial approval of the three existing uses combined into this Approved Use. The potential for ingestion is minimal, due to the nature of the work sites and application equipment covered by this use. Appropriate signage will be required to clearly identify the reclaimed water as non-potable. Inhalation potential for persons working with reclaimed water for these uses is typically minimal, in that little or no aerosol production from reclaimed water distribution and application is expected, and any aerosols that are created should quickly disperse. Should any elevated potential for aerosol production and inhalation be identified for a specific application, use-specific BMPs will be specified in the Notice of Authorization. Dermal contact potential is low, given the nature of the use and BMPs such as signage and employee training. There is negligible potential for exposure of the general public to reclaimed water under this use, because the sites are off-limits to the public or the water used on public streets will quickly evaporate. Ponding and over-application is prohibited through existing BMPs in the regulation that apply to the existing approved uses under this category.

The potential for cross-connection is minimal, since reclaimed water piping for construction and road maintenance uses will not be introduced into the interior of buildings where potable water piping is present, and construction and maintenance activities will generally occur outdoors. Rather, access will typically be from dedicated reclaimed water taps or hydrants. Trucks and other portable equipment will be marked with appropriate signage and not used for potable water, in accordance with existing BMPs in the regulation that apply to this Approved Use.

Environmental protection is afforded by the continued requirement to minimize ponding and runoff, consistent with the previously approved uses per Section 84.8(A)(3) which requires that "Application rates shall minimize ponding on or runoff from the area approved for application or use." This requirement is carried forward as an additional requirement for Non-Discharging Construction and Road Maintenance.

Protection of human health, the environment, and cross-connections is further afforded by the existing Regulation No. 84 requirements for:

- Restrictions on area of use (84.9(C)(1), 84.9(C)(2), and 84.9(C)(9))
- Notification, signage, markings, and worker education (84.9(C)(3), and 84.9(C)(4))
- Cross-connection controls (84.9(C)(5), 84.9(C)(7), and 84.9(C)(8))
- The additional conditions included in section 84.8, as applicable.

Category 1 reclaimed water is acceptable for this use, consistent with the requirements for the previously approved uses.

Washwater Applications

This use has been evaluated for risks to human health via ingestion, inhalation, and dermal contact. The potential for discharging reclaimed water to a water of the state (groundwater or surface water) has also been evaluated. BMPs and allowable water qualities are specified to mitigate these risks.

The Commission previously approved the “use of Category 2 water for mixing, washing and truck supply water as long as the User complies with the requirements set forth in section 84.9” (per 84.8(A)(2)). Similarly, it can be concluded that washwater applications of maintenance equipment (e.g., mowers, aerators, power sweepers) and other washwater applications are protective of the environment when the washwater runoff is contained (e.g., flow to lined pit, approved containment area, or sanitary sewer), as to prevent any offsite surface water runoff or discharge of reclaimed water to groundwater. The following protections that apply to the concrete washout use would also apply to other uses that fit into this category:

- The public is not present on the job site where the washing is conducted so non-worker exposure to reclaimed water is not a concern. Workers will be trained in proper procedures and utilize BMPs to prevent or minimize pathways of human exposure, windblown spray, and unintended overspray.
- Environmental protection is afforded as the potential for runoff/discharge of reclaimed water will be prevented with proper BMPs.

- Inhalation exposure potential comes from aerosols generated by the washing processes being inhaled. Exposure to aerosols may be encountered by the operators of the wash equipment and is minimized by the use of standard hose spray nozzles that create a larger droplet size and not using high pressure washers. In accordance with the requirements of Section 84.8(A)(7), additional measures will be required if there is potential for frequent personal exposure to aerosols.

- The potential for cross connections is minimal, since washing applications will only take place were dedicated reclaimed water taps are available and done by trained personnel.

Protection of human health, the environment, and cross-connections is further afforded by the existing Regulation No. 84 requirements for:

- Restrictions on area of use (84.9(C)(1), 84.9(C)(2), and 84.9(C)(9))

- Notification, signage, markings, and worker education (84.9(C)(3), and 84.9(C)(4))

- Cross-connection controls (84.9(C)(5), 84.9(C)(7), and 84.9(C)(8))

- The additional conditions included in section 84.8, as applicable.

Commercial Laundries, Automated Vehicle Washing, and Manual Non-Public Vehicle Washing

Ingestion. The potential for ingestion is negligible for all three proposed uses, in light of the limited access to the public and the commercial and industrial nature of the water use. The low risk of ingestion in these new uses is equivalent to the risk associated with existing potable-supplied facilities and is further mitigated by the BMPs specified for these uses in Regulation No. 84. Water quality requirements for Reclaimed Water under Regulation No. 84 specify E.coli levels based on EPA swim beach standards, which assumed incidental ingestion of up to 100 mL of water and full-body water contact as described in 84.21(E). The potential risks associated with ingestion are similar to or less than those of the previously approved Commercial and Industrial uses of Category 1, 2, and 3 Reclaimed Water in Regulation No. 84.

Inhalation. The potential for inhalation of reclaimed water aerosols at Commercial Laundries is negligible, because those facilities typically use direct piping of process water to boiler systems, washing machines, and other processing equipment. Aerosols are not typically produced in commercial laundry worker areas. Steam rising above washing or pressing equipment can occur in minor quantities, but typically has been exposed to high heat, is not present in workers' immediate work area, and dissipates rapidly.

In Automated Vehicle Washing facilities, there is a potential for aerosols generated in the washing area to drift to worker or public areas, depending on the facility's specific configuration and operational practices. However, workers and public users of automated vehicle washes are not in contact with the vast majority of aerosols generated in the process, as

they are either inside the vehicle or in a separate waiting area during the vehicle washing process. Workers at Manual Non-Public Vehicle Washing facilities are much more likely to be in direct and/or frequent contact with aerosols generated during the washing process, as they are operating the equipment (e.g., high pressure wands) outside the vehicle in close proximity to the point of application.

In light of the potential worker or public contact with aerosols in vehicle washing applications, the Proponents evaluated additional information to assess the potential for human health effects of such contact. This information includes the 2012 USEPA Guidelines for Water Reuse, regulations in other states that authorize commercial laundry and vehicle washing uses, the previously identified risk assessment based on available research and literature regarding health impacts of inhalation of recycled water aerosols (Exhibit 4), and a comparison of water quality in internally-recycled vehicle washing water systems fed by potable water to the water quality of recycled water produced by an existing Treater.

In the 2012 EPA Guidelines for Water Reuse, vehicle washing and commercial laundries are not specifically identified as categories of reuse. However, these uses are mentioned in several sections of the document and are consistent with the EPA Guidelines' definition of Restricted Urban Reuse (i.e., "The use of reclaimed water for nonpotable applications in municipal settings where public access is controlled or restricted by physical or institutional barriers, such as fencing, advisory signage, or temporal access restriction"). This definition is relevant for Colorado's proposed Commercial Laundries and Manual Non-Public Vehicle Washing uses, which by definition are limited to facilities that are not open to the public. It is also relevant for Automated Vehicle Washing, both in commercial or industrial applications where there is no public access, and in publicly-accessible vehicle washing facilities, due to the limited potential for public exposure to the water in the automated washing process.

The EPA's suggested guidelines for Restricted Urban Reuse are generally consistent with the requirements for Colorado Reclaimed Water Category 2 (i.e., secondary treatment and disinfection, with comparable limits specified for indicator organisms and total suspended solids). However, EPA's Restricted Urban Reuse treatment guidelines note that "For use in construction activities including soil compaction, dust control, washing aggregate, making concrete, worker contact with reclaimed water should be minimized and a higher level of disinfection (e.g., <14 fecal coli/100 mL) should be provided when frequent worker contact with reclaimed water is likely."

This indicates that a high level of disinfection (higher than that specified for Restricted Urban Reuse) is appropriate for situations where there is a high likelihood of frequent worker contact. In the alternative, BMPs should be employed to prevent frequent worker inhalation exposure (e.g., physical barriers between aerosol sources and humans, personal equipment to prevent aerosol inhalation, or other approved means) if less stringent disinfection is employed. This supports an approach where aerosol inhalation risks are mitigated either through:

- Use of high-level disinfection (i.e., Colorado Reclaimed Water Category 3), or
- Use of lower-level disinfection (i.e., Colorado Reclaimed Water Category 2) with BMPs to prevent frequent inhalation of aerosols.

Risks and protection of human health relative to inhalation of aerosols is addressed in several sections of the EPA Guidelines. The EPA Guidelines cite studies concluding that inhalation of aerosols presents human health risks for recycled water when the recycled water is undisinfected or improperly disinfected. Consistent with this finding, the EPA Guidelines and many states' regulations do not require filtration or high-level disinfection (i.e., non-detectable or near-non-detectable levels of indicator organisms) for cooling towers, instead specifying BMPs for mitigating aerosol inhalation risks for cooling tower use. The previously-approved cooling tower use in Regulation No. 84 follows this precedent, allowing the use of Category 1, 2, or 3 water for Evaporative Industrial Process (formerly named Cooling Tower) use but specifying aerosol risk mitigation via additional conditions at 84.8(A)(1).

In contrast, the EPA Guidelines and several states' regulations do specify filtration and high-level disinfection for vehicle washing and commercial laundry uses, with no BMPs for mitigating aerosol inhalation risks (other than prevention of aerosol drift to dwellings or food preparation/consumption areas, similar to the existing requirements at Section 84.9(C)(1) of Regulation No. 84).

For example, California's Title 22 Code of Regulations authorizes the use of reclaimed water for commercial laundries and car washes. The Final Statement of Reasons supporting that authorization states that the new uses approved under Section 60307 "…pose as much risk for public contact with the (reclaimed) water through direct contact, inhalation, or ingestion, as (irrigation)…" (California Code of Regulations, Title 22, Article 3, Section 60307, 2009). California requires filtration and high-level disinfection for commercial laundries and vehicle washing, but neither filtration or high-level disinfection are required for cooling towers. Consequently in California, aerosol drift from cooling towers must be managed, but no aerosol control BMPs are specified for vehicle washing uses (other than prevention of aerosol drift to dwellings or food preparation/consumption areas).

The EPA Guidelines also reference a risk assessment study of car washes using internally recycled water. Public users of the car wash were infrequently exposed to aerosols and workers were exposed to aerosols up to 15 times daily generated in the manual washing process. "A risk analysis indicated that car wash users were not at risk from E. coli present in the recycled water, and that a limit of 200 CFU/100mL of E. coli would be recommended for an acceptable risk for car wash operators." Notably, Colorado's Category 3 Reclaimed Water requires a single-sample maximum of 126 E. coli per 100 mL, while Category 2 allows single-sample E. coli readings up to 235 E. coli per 100 mL.

Similar uses have been in place in states such as California and Florida for years. The EPA Guidelines cite a recent National Research Council (NRC) report on reuse (NRC 2012)

providing a historical perspective on the safe track record of reuse systems in the United States. The NRC's analysis of epidemiological data found no trends in health issues with historical reclaimed water use in the United States.

A review of the EPA Guidelines and other states' regulations relative to the proposed uses supports the following conclusions:

- Inhalation of aerosols is of concern when recycled water is not disinfected or is minimally disinfected, but does not pose a significant human health risk when recycled water is highly disinfected (e.g., Category 3 Reclaimed Water).

- Secondary treatment and disinfection (Category 2 Reclaimed Water) is an appropriate treatment requirement for the use of reclaimed water in commercial laundry and vehicle washing facilities where there is not a high likelihood of frequent worker or public exposure to aerosols generated from reclaimed water use.

- In facilities with a high likelihood of frequent worker or public exposure to aerosols generated from reclaimed water use, filtration and high-level disinfection (Category 3 Reclaimed Water) provides human health protection against aerosol inhalation risks. Alternatively, BMPs can be used to prevent the frequent inhalation of aerosols with use of Reclaimed Water Category 2.

- Effective BMPs for physically preventing frequent human contact with aerosols may include 100-foot setback distances (similar to the irrigation setback from water supply wells specified under Section 84.9(C)(9), and consistent with other states' requirements for protection of food preparation or consumption areas), physical barriers such as curtains or other means of containing aerosols to the area of generation, personal protective equipment to prevent inhalation of aerosols, or other means as may be appropriate to the site and use.

The addition of the new Additional Condition at Section 84.8(A)(7) provides for this protection, as follows: "Where there is the reasonable potential for worker or public exposure to aerosols generated in the use, Users of Category 1 Reclaimed Water (if allowed for the use per Table A) or Category 2 Reclaimed Water shall employ measures to prevent the frequent exposure of workers and the public to aerosols generated in the use of reclaimed water. Measures shall include at least one of the following: minimum setback distance of 100 feet between the nearest source of aerosol generation and areas where workers or the public are normally present; physical barriers between aerosol sources and humans; personal protective equipment to prevent aerosol inhalation; functionally equivalent measures approved by a qualified individual (e.g., a certified industrial hygienist); or other means approved by the Division. Given the higher level of treatment provided for Category 3 Reclaimed Water, additional measures to address exposure of workers or the public to aerosols are not required."

This Additional Condition is applicable to the following renamed and new uses where Category 1 or 2 water is used, in consideration of the type of use and potential for worker or public exposure to aerosols: Washwater Applications, Non-Discharging Construction and Road Maintenance, Non-Evaporative Industrial Processes, Commercial Laundries, Automated Vehicle Washing, and Manual Non-Public Vehicle Washing. This Additional Condition will prevent the frequent exposure of workers and the public to aerosols, such that the intensity and duration of aerosol exposure is comparable to that encountered by workers and the public under other existing approved uses with the same or lower water quality. For example, Restricted Access Landscape Irrigation is authorized for Category 1 water use and has no limits on the frequency or duration of worker exposure to aerosols generated by irrigation equipment. Unrestricted Access Landscape Irrigation is authorized for Category 2 water use and has no limits on the frequency or duration of worker or public exposure to aerosols generated by irrigation equipment.

Commercial, Industrial, and Fire Protection Users (which would include the proposed vehicle washing and commercial laundry uses) are required to provide the following information in a User Plan to Comply, pursuant to existing Section 84.9(B)(6):

> Best management practices the user intends to implement to prevent or minimize direct and windblown spray and other pathways of human exposure to reclaimed water;

This provides the Division with the opportunity to consider and approve the proposed measures to protect against aerosol inhalation risks. Further definition of the BMPs and allowable risks, considering the limited exposure of workers and the public to aerosols generated with Category 2 water after application of these BMPs, can and should be provided through development of a Division policy. This is consistent with existing Commission and Division practice, where the regulation specifies the overall requirements, but specific details are provided in Division policy documents. An example of this is the Division's existing Policy WQP-21, titled "Guidelines for Determination of Agronomic Rate for Application of Reclaimed Water Under Colorado Regulation No. 84." That policy provides details on how compliance with the agronomic rate requirements of the regulation (specified in Regulation No. 84 at 84.6(A)(3)) can be calculated and documented in the Treater's Letter of Intent.

Dermal contact. The employees of commercial laundries may be exposed to reclaimed water via skin contact regularly while transferring laundry from washing machines. The public could encounter infrequent skin contact with reclaimed water in the unlikely event that laundered materials were not completely dried. Dermal contact at automated vehicle washes will be negligible during normal washing operations, due to the automated nature of those operations. Intermittent dermal contact for workers at manual non-public vehicle washes is already minimized by clothing or other equipment typically worn by operators of that equipment for reasons of personal comfort, regardless of the source of water to the facility, and the level of potential dermal contact is significantly less than the full-body contact allowed with similar water quality under EPA swim beach standards.

In each of these scenarios, the overall risk to Commercial Laundry and Vehicle Washing workers and the public associated with ingestion and dermal contact is less than swimming at a swim beach and comparable to or less than other previously approved commercial and industrial uses of Category 1, 2, and 3 Reclaimed Water. Water quality requirements for Reclaimed Water under Regulation No. 84 specify E.coli levels based on EPA swim beach standards, based on incidental ingestion of up to 100 mL of water and full-body water contact as described in 84.21(E). The potential risks associated with dermal contact or ingestion via dermal contact are similar to or less than those of the previously approved Commercial and Industrial uses of Category 1, 2, and 3 Reclaimed Water in Regulation No. 84.

Cross connections. For each of these proposed uses, the potential for cross-connecting potable and recycled water piping is similar to previously approved Commercial and Industrial uses of Category 1, 2, and 3 Reclaimed Water, with potable and reclaimed water piping in the same vicinity but accessible by trained personnel only. Commercial laundries typically use various chemicals as part of their wash operations, so process water is considered non-potable and usually requires use of reduced-pressure backflow prevention assemblies to protect the potable distribution system from cross-connections. Similarly, vehicle washes typically already employ backflow prevention devices to maintain separation between potable systems and process water that can contain soaps and other wash chemicals, plus contaminants in internal recycle systems from washed vehicles. The existing BMPs for cross-connection control in Regulation No. 84 (at 84.9(C)(5), 84.9(C)(7), and 84.9(C)(8)) will apply to these new uses as well.

Releases to waters of the state. The cost of water is a significant expense for commercial laundries and vehicle washing facilities. These facilities typically make every effort to conserve water where possible. In many facilities, this includes specialized equipment to minimize losses through internal recycling and designing facilities with impervious surfaces with drains to capture potential runoff or spills. In commercial laundries, water used for cleaning and pressing textile products is typically contained entirely in closed-loop piping systems, with ultimate discharge to sanitary sewer. In automated and manual vehicle washes, water is typically internally recycled and/or discharged to sanitary sewers. Losses are typically through evaporation, drift of aerosols, and carryout on vehicles exiting the washing area. Drift of aerosols as it relates to human health was discussed above. Aerosol drift beyond the immediate washing area (which is typically contained using a sump to internal recycle and/or sanitary sewer discharge) is not of sufficient quantity to cause runoff to waters of the state before evaporating.

Carryout (e.g., water dripping off of vehicles as they exit the washing facility) of reclaimed water could occur, depending on the washing/drying process employed and the site-specific facility configuration. However, carryout of water sourced with potable supplies is already prohibited from causing unpermitted runoff to waters of the state under Clean Water Act requirements, and BMPs for car washes include prevention of such runoff by containing the exit area with drainage to sanitary sewer or other non-discharging end point. These areas are typically indoors or under a canopy-type cover to prevent introduction of precipitation and stormwater into the sanitary sewer system. Mitigation of the potential for offsite runoff and

discharges to waters of the state can be mitigated by BMPs preventing such runoff/discharge as specified for the proposed vehicle washing uses.

Accordingly, Section 84.8(A)(3) will be modified to read "Application rates or other measures shall be employed to minimize ponding on or runoff from the area approved for application or use," and specified that this Additional Condition be required for Automated Vehicle Washing and Manual Non-Public Vehicle Washing uses.

Additional protections. Protection of human health, the environment, and cross-connections is further afforded by the existing Regulation No. 84 requirements (applicable to all uses) for:

- Restrictions on area of use (84.9(C)(1), 84.9(C)(2), and 84.9(C)(9))
- Notification, signage, markings, and worker education (84.9(C)(3) and 84.9(C)(4))
- Cross-connection controls (84.9(C)(5), 84.9(C)(7), and 84.9(C)(8))
- The additional conditions included in section 84.8, as applicable.

With the existing general BMPs, the new Additional Condition at Section 84.8(A)(7), and the conditions specified for each new use, Category 2 reclaimed water is acceptable for use in Commercial Laundries, Automated Vehicle Washing, and Manual Non-Public Vehicle Washing.

<u>Non-Food Crop Irrigation and Silviculture</u>

The use of reclaimed water for irrigation of certain agricultural crops and trees, when implemented in accordance with reclaimed water quality standards and BMPs in Regulation No. 84, is protective of public health and the environment. In both the United States and worldwide, more reclaimed water has historically been used for agricultural irrigation than for all other uses combined. Adding agricultural irrigation as an approved use of reclaimed water will encourage the expanded use of reclaimed water in Colorado and is anticipated to reduce the regulatory compliance burden on Treaters and Users by allowing them to be permitted under a single control regulation where multiple approved uses of reclaimed water are implemented.

Health risks to the public or workers associated with potential contact with reclaimed water used for agricultural irrigation were determined to be of a comparable or lower magnitude than those associated with landscape irrigation. This is due to the typical exclusion of the public from agricultural fields and the training of agricultural workers to industrial hazards. Also, there is typically no expectation by the public or workers that water used for agricultural irrigation will be of a potable quality.

Public health risks associated with ingestion of reclaimed water used for agricultural irrigation pursuant to Regulation No. 84 are avoided due to restrictions of crop-type; with the irrigation of

crops produced for direct human consumption, trees that bear fruit or nuts intended for human consumption, and range crops where dairy animals forage being prohibited at this time.

Environmental risks associated with runoff or excessive percolation of reclaimed water to waters of the state are determined to be of a comparable or lower magnitude than those risks associated with landscape irrigation. When compared with landscape irrigation, agricultural irrigation often occurs on larger tracts of undivided land of relatively uniform soils type and which are unencumbered by pavement, sidewalks and other impervious areas and also is often comprised of larger areas of a single crop with more uniform evapotranspiration rates; distinctions that facilitate the accurate determination and subsequent application of appropriate irrigation rates to limit excessive surface runoff, ponding or percolation to groundwater. These same distinctions facilitate the ability of agricultural Users to determine nutrient requirements of their crops and to adjust fertilizer applications so as to obtain maximum benefits of the nutrients in the reclaimed water.

There is little increased risk of cross connection associated with the use of reclaimed water versus traditional sources of water used for agricultural irrigation.

Category 1 water is acceptable for irrigation of those non-food crops permitted to be irrigated with reclaimed water pursuant to this Control Regulation and that the criteria for Category 1 water are generally consistent with the treatment level requirements and water quality standards adopted by several other states (e.g., Arizona, California, Florida, Texas, et al.) and countries for the irrigation of non-food crops.

Because of the similarity in human health and environmental risks, the BMPs established for restricted access landscape irrigation are appropriate and adequate for agricultural irrigation.

Protection of human health, the environment, and cross-connections is further afforded by the existing Regulation No. 84 requirements for:

- Restrictions on area of use (84.9(C)(1), 84.9(C)(2), and 84.9(C)(9))
- Notification, signage, markings, and worker education (84.9(C)(3), 84.9(C)(4), and 84.9(C)(6))
- Cross-connection controls (84.9(C)(5), 84.9(C)(7), and 84.9(C)(8))
- The additional conditions included in section 84.8, as applicable.

Annual Report Requirements

As part of this rulemaking, the annual reporting will be changed from January 31 of each year to March 31, to allow Treaters sufficient opportunity to compile reclaimed water use data and related records from the preceding calendar year.

Summary

Available risk assessment information, other states' regulations, and other information demonstrate that the identified requirements for the quality of the reclaimed water and/or the applicable BMPs will ensure that proposed new uses will be protective of public health and the environment. Approval of these uses will allow for increased use of reclaimed water, allowing municipalities to make more efficient use of available water resources.

Proponent's Exhibit 4

DENVER WATER EVALUATION OF CONVERTING CAR WASHES AND LAUNDRIES FROM POTABLE WATER TO RECLAIMED WATER FINAL REPORT

DENVER WATER

Proponent's Exhibit 4

Evaluation of Converting Car Washes and Laundries from Potable Water to Reclaimed Water

February 2013

FINAL REPORT

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DENVER WATER

EVALUATION OF CONVERTING CAR WASHES AND LAUNDRIES FROM POTABLE WATER TO RECLAIMED WATER

REPORT

FINAL
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DENVER WATER

EVALUATION OF CONVERTING CAR WASHES AND LAUNDRIES FROM POTABLE WATER TO RECLAIMED WATER

REPORT

TABLE OF CONTENTS

Page

LIST OF APPENDICES

LIST OF TABLES

EVALUATION OF CONVERTING CAR WASHES AND LAUNDRIES FROM POTABLE WATER TO RECLAIMED WATER

EXECUTIVE SUMMARY

This study evaluated the use of reclaimed water in the State of Colorado for three new uses not previously authorized under Colorado's Reclaimed Water Control Regulation (Regulation 84): Commercial Laundries, Automated Vehicle Washing, and Manual Non-Public Vehicle Washing. The evaluation focused on the characterization of risk potential for human health risks via ingestion, inhalation, dermal contact, and cross-connection with potable water systems, as well as the potential for discharging reclaimed water to a water of the state (groundwater or surface water). Typical uses of water in commercial laundries and automated and manual vehicle washing facilities were reviewed to characterize the potential for human contact with reclaimed water and releases of reclaimed water to waters of the state. These findings were combined with a risk assessment conducted through a literature review and a sampling program to compare the relative water quality of the current process water used at vehicle washing and commercial laundry facilities with recycled water meeting Category 3 standards under Regulation 84.

ES.1 Summary of Human and Environmental Exposure Potential

Field investigations at representative commercial laundry facilities and automated and manual vehicle washing facilities were used to characterize the uses of water at each type of facility. These investigations also provided insights into the potential human and environmental exposure pathways.

The following conclusions were drawn from the field investigations.

Ingestion: Because of the industrial nature of the operations, ingestion of process water in commercial laundry and vehicle washing facilities is unlikely and would be highly unusual. Moreover, the closed-system piping arrangements in commercial laundries and the use of automated equipment to apply water in automated vehicle washes severely limits access to process water. Application of the additional conditions already embodied in Regulation 84 (signage, labeling, pipe coloring, worker training, etc.) will further protect against the potential for intentional or incidental ingestion. Water quality requirements for Reclaimed Water under Regulation 84 specify *Escherichia coli (E. coli)* levels based on EPA swim beach standards, based on incidental ingestion of up to 100 mL of water and full-body water contact as described in Regulation 84, Section 84.21(E). This exposure level during swimming is considered to be higher than the potential exposure levels due to incidental ingestion in the proposed applications. It is therefore concluded that the potential risks associated with ingestion are similar to or less than those of the previously approved Commercial and Industrial uses of Categories 1, 2, and 3 Reclaimed Water in Regulation 84.

Inhalation: Aerosols are not generated in the use of process water in commercial laundries. Limited amounts of steam released from washing or pressing equipment are not located in the immediate worker area and dissipate rapidly within a few feet above the equipment. There is the potential for aerosols to drift into worker or public areas adjacent to automated vehicle washing facilities, depending on site-specific layouts and ambient wind conditions. However, workers and public users of automated vehicle washes are not in contact with the vast majority of aerosols generated in the process, as they are either inside the vehicle or in a separate waiting area during the vehicle washing process. Workers at manual non-public vehicle washing facilities may be exposed to aerosols and splash-back from the manual washing equipment as they are operating the equipment (e.g., high-pressure wands) outside the vehicle in close proximity to the point of application.

In light of the potential worker or public contact with aerosols in vehicle washing applications, additional information was considered to assess the potential for human health effects of such contact. This information included the 2012 *USEPA Guidelines for Water Reuse* (2012 EPA Guidelines, USEPA, 2012), regulations in other states that authorize vehicle washing uses, a risk assessment based on available research and literature regarding health impacts of inhalation of recycled water aerosols, and a comparison of water quality in internally-recycled vehicle washing water systems fed by potable water to the water quality of recycled water produced by Denver Water (Category 3 classification).

The 2012 EPA Guidelines, regulations in other states and literature regarding health impacts of inhalation of recycled water aerosols all support the conclusion that exposure to aerosols does not pose a significant health risk as long as the reclaimed water is subjected to high-level disinfection as required for Category 3 reclaimed water per Regulation 84. It is recommended that best management practices (BMPs) be utilized to minimize aerosol exposure for workers and the public in applications where lower-level disinfected reclaimed water (i.e., Category 2) is employed for vehicle wash operations.

Dermal contact: Normal operations do not involve significant dermal contact at commercial laundry or vehicle washing facilities. At commercial laundries, dermal contact is generally limited to intermittent handling of damp textile products when transferring the products from one process area to another. Automated vehicle washing facilities generally do not have workers or members of the public in the wash bay during washing operations, minimizing the potential for dermal contact. At manual vehicle washing facilities, workers are more directly involved in the application of water to vehicles, but protective clothing and other measures are already in place for personal comfort and safety reasons, minimizing the potential for dermal contact with wash water in this application. It is therefore concluded that in each of these uses, the overall risk to commercial laundry and vehicle washing workers (and the general public) associated with dermal contact are similar to or less than those of the previously approved Commercial and Industrial uses of Categories 1, 2, and 3 Reclaimed Water in Regulation 84.

Cross-connections: Cross-connections are a potential concern at any facility that uses both potable water and reclaimed water. Backflow prevention devices are already in place at many commercial laundry and vehicle washing facilities, to prevent cross-connections between potable systems and process water systems. Cross-connection potential will be

further mitigated through application of the existing cross-connection control measures embodied in Regulation 84.

Environmental releases: The cost of water is a significant expense for commercial laundries and vehicle washing facilities. These facilities typically make efforts to conserve water where practical to do so. In many facilities, this includes specialized equipment to minimize losses through internal recycling and designing facilities with impervious surfaces with drains to capture potential runoff or spills. In commercial laundries, water used for cleaning and pressing textile products is typically contained entirely in closed-loop piping systems, with ultimate discharge to a sanitary sewer or other means of preventing releases to waters of the state. In automated and manual vehicle washes, water is typically internally recycled and/or discharged to sanitary sewers. Losses are typically through evaporation, drift of aerosols, and carryout on vehicles exiting the washing area. Drift of aerosols as it relates to human health was discussed above. Aerosol drift beyond the immediate washing area (which is typically contained using a sump to internal recycle and/or sanitary sewer discharge) is not of sufficient quantity or water content to cause runoff to waters of the state before evaporating.

Carryout (e.g., water dripping off vehicles as they exit the washing facility) of reclaimed water could occur, depending on the washing/drying process employed and the site-specific facility configuration. However, commercial laundry and vehicle washing facilities are already prohibited from discharging potable or process water to waters of the state (surface water or groundwater). Modifying the source of water service from potable supplies to reclaimed water supplies would not change the requirement that is already in place to prevent releases of process water to waters of the state.

ES.2 Reclaimed Water Categories and Conditions of Use for Proposed Uses

The evaluation of human health and environmental protection in this study drew upon the following sources of information relevant to commercial laundry, automated vehicle washing, and manual non-public vehicle washing uses of recycled water:

- Observations of water use in representative laundry and vehicle washing facilities, as described above;
- EPA 2012 Guidelines for Water Reuse;
- Other states' regulations and guidelines for similar uses;
- Comparison of the risks associated with the proposed uses to those of previously-approved reclaimed water uses under Colorado's Regulation 84;
- Previous studies assessing risks of reclaimed water use; and
- Comparison of recycled water quality to existing internally recycled process water at representative facilities.

Together, these sources supported an overall conclusion that:

- Ingestion, dermal contact, cross-connections, and environmental exposure to reclaimed water is unlikely to occur in commercial laundries and vehicle washing facilities, and can be further mitigated through conditions of use specified in Regulation 84.
- There is the potential for frequent inhalation of aerosols in vehicle washing facilities.
- Aerosol inhalation presents human health risks only in situations where recycled water is not highly disinfected.
- Aerosol inhalation risks can be mitigated through use of highly disinfected reclaimed water (i.e., Category 3 reclaimed water), or through use of Category 2 reclaimed water in conjunction with conditions of use that minimize exposure of workers and the public to aerosols.

Table ES.1 summarizes the proposed reclaimed water category and conditions of use for each proposed use for protection of human health, the environment, and prevention of cross-connections.

Table ES.1 Regulation 84 Reclaimed Water Categories and Conditions of Use for Proposed Uses

Use	Category 1 Water Quality	Category 2 Water Quality	Category 3 Water Quality
Commercial Laundries	Not Allowed	Allowed(1,2)	Allowed(1)
Automatic Vehicle Washing	Not Allowed	Allowed(1,2,3)	Allowed(1,3)
Manual Non-Public Vehicle Washing	Not Allowed	Allowed(1,2,3)	Allowed(1,3)

Notes:

(1) The following additional conditions apply:
- Restrictions on area of use (84.9(C)(1), 84.9(C)(2), and 84.9(C)(9)).
- Notification, signage, markings, and worker education (84.9(C)(3) and 84.9(C)(4)).
- Cross-connection controls (84.9(C)(5), 84.9(C)(7), and 84.9(C)(8)).

(2) The following additional conditions apply:
- Where there is the reasonable potential for worker or public exposure to aerosols generated in the use, Users of Category 1 Reclaimed Water (if allowed for the use per Table A) or Category 2 Reclaimed Water shall employ measures to prevent the frequent exposure of workers and the public to aerosols generated in the use of reclaimed water. Measures shall include at least one of the following: minimum setback distance of 100 feet between the nearest source of aerosol generation and areas where workers or the public are normally present; physical barriers between aerosol sources and humans; personal protective equipment to prevent aerosol inhalation; functionally equivalent measures approved by a qualified individual (e.g., a certified industrial hygienist); or other means approved by the Division. Given the higher level of treatment provided for Category 3 Reclaimed Water, additional measures to address exposure of workers or the public to aerosols are not required. (Proposed 84.8(A)(7).)

(3) The following additional conditions apply:
- Application rates or other measures shall be employed to minimize ponding on or runoff from the area approved for application or use. (Proposed 84.8(A)(3).)

1.0 INTRODUCTION

Municipal water recycling systems often start with irrigation uses: large demands that do not require potable quality water, and typically do not require significant treatment process upgrades. As these non-potable reuse ("purple pipe") distribution systems stretch further into the community, additional demands and other use types are added.

Not coincidentally, Colorado's reuse regulations have followed a similar path over time, as treaters and users proposed the addition of new authorized uses under Colorado's Reclaimed Water Control Regulation (Regulation 84) to match their plans for increased water recycling. What was once a regulation focused exclusively on landscape irrigation now allows for a variety of specific commercial, industrial, and fire protection use.

The terms "reclaimed water," "recycled water," and "reuse" are used interchangeably in this report. Denver Water typically uses the term "recycled water," whereas Regulation 84 defines "reclaimed water" as "domestic wastewater that has received secondary treatment by a domestic wastewater treatment works and such additional treatment as to enable the wastewater to meet the standards for approved uses."

1.1 Evolution of Regulation 84 Since Its Implementation

Since its adoption in October 2000 by the Water Quality Control Commission (WQCC), Regulation 84 has undergone several amendments that expanded the range of approved uses over time. The initial regulation authorized the use of reclaimed water for Restricted and Unrestricted Access Landscape Irrigation. Prior to this, reuse systems were approved on a case-by-case basis, and requirements were specified in the discharge permit for each facility treating water for reuse. As the program was implemented and interest in reuse in Colorado grew, the following amendments were made to Regulation 84:

- May 2004: Addition of several Commercial and Industrial approved uses, clarifications of certain provisions of the regulation, and modifications to administrative protocol.
- October 2005: Addition of Category 3 water and new approved uses for Fire Protection and Resident-Controlled Landscape Irrigation, and numerous clarifications and modifications to administrative protocol.
- August 2007: Revised provisions related to landscape irrigation and coordination of regulations.

In pursuit of further expansions in both the amount of recycled water use and the types of water recycling uses, in late summer 2012 the Colorado Water Quality Forum's Regulation 84 Work Group requested a Colorado Water Quality Control Commission Rulemaking Hearing for combining, renaming, and adding several authorized uses for reclaimed water. The hearing is scheduled for May 2013, with proposed modifications that include:

- Renaming “Cooling Tower” to “Evaporative Industrial Uses”;
- Renaming “Closed Loop Cooling System” to “Non-Evaporative Industrial Processes”;
- Combining and renaming “Soil Compaction” and “Mechanized Street Cleaning” to “Non-Discharging Construction and Road Maintenance”;
- Dividing “Concrete Mixing and Washout” into two uses, “Non-Evaporative Industrial Processes” and “Washwater Applications”;
- Adding a new Agriculture use category with an approved use for Non-Food Crop Irrigation and Silviculture (tree growing operations); and
- Adding the following Commercial Uses: Commercial Laundries, Automated Vehicle Washing, and Manual Non-Public Vehicle Washing.

In proposing these changes and additions, the Work Group endorsed the continued protection of human health (both workers and the public) and the environment through explicit requirements for water quality, treatment, and implementation and operations through best management practices.

1.2 New Uses Assessed in this Study

Denver Water has identified vehicle washing and commercial laundry facilities as demands that are potential candidates for conversion in upcoming years from potable water supply to recycled water supply. To provide greater certainty for its recycled water system planning and implementation, Denver Water undertook an assessment of these uses in advance of, and in support of, the May 2013 Water Quality Control Commission hearing.

This report evaluates three new uses for approval under Regulation 84 in Colorado, namely:

- Commercial Laundries,
- Automated Vehicle Washing, and
- Manual Non-Public Vehicle Washing.

The majority of the Reclaimed Water Work Group’s proposed changes to Regulation 84 involve renaming or modifying existing approved uses of recycled water. However, the proposed vehicle washing and commercial laundry uses were assessed in detail for their potential human health and environmental risks because their exposure potential and pathways differ from the other approved and proposed uses under Regulation 84. Vehicle washes are divided into two uses, Automated Vehicle Washing (including facilities not accessible to the public and publicly accessible vehicle washing facilities), and Manual Non-Public Vehicle Washing facilities.

Publicly accessible manual vehicle washing facilities were excluded from the proposal to the WQCC. These facilities are associated with a higher potential for personal contact, and the Work Group recognized the impracticality of providing training on proper recycled water use to the general public compared to automated or employee-operated facilities.

1.3 Public and Environmental Protection in Regulation 84

Protection of human health and the environment are the overarching goals of Regulation 84. For each authorized use under Regulation 84, these goals are achieved through treatment and water quality requirements and conditions of use specified under Sections 84.8 and 84.9 of the regulation. Three treatment and water quality categories have been established in the regulation, ranging from Category 1 (least stringent requirements) to Category 3 (most stringent requirements) (Table 1). Each authorized use includes specification of a minimum Reclaimed Water category, general conditions of use (Section 84.9), and additional conditions specific to its use (Section 84.4). These additional conditions are also sometimes referred to in the industry as "best management practices" or BMPs.

Table 1 Categories and Standards of Recycled Water Defined in Regulation 84

Effluent Parameter	Category 1	Category 2	Category 3
E. coli			
Single sample max.	235/100 mL		126
Monthly geometric mean	126/100 mL		NA
75% of samples in calendar month	NA	NA	None Detected
Total Suspended Solids (TSS) (daily max.)	30 mg/L	NA	NA
Turbidity			
Monthly average	NA	≤ 3 NTU	≤ 3 NTU
≤ 5% of samples during any calendar month	NA	> 5 NTU	> 5 NTU
Treatment	Secondary Treatment with Disinfection	Secondary Treatment with Filtration and Disinfection	Secondary Treatment with Filtration and Disinfection

Notes:
(1) Source: Regulation 84, Section 84.7.
NA Not Applicable.

The possible exposure routes for human contact and environmental releases associated with the new uses that were analyzed in this study include:

- Personal exposure: Ingestion of recycled water, inhalation of recycled water aerosols (small water droplets generated during use), and dermal contact with recycled water.
- Environmental exposure: Potential releases to surface water or groundwater.
- Cross-connection exposure: Potential physical interconnections with potable water piping systems.

Protection against these concerns is founded in the general preventative requirements that are specified in Regulation 84. Table 2 summarizes additional conditions required in Regulation 84 for each of the exposure routes. For example, signage, worker training, and other BMPs are geared toward the prevention of incidental ingestion of recycled water. If there is a significant likelihood for aerosols to drift from cooling towers to public or worker areas, adequate signage and consideration of supplemental BMPs is required. Dermal contact is not explicitly addressed in Regulation 84, as the authorized uses do not pose a significant dermal exposure risk for workers or the general public. Releases of reclaimed water via runoff or percolation from the reuse site are generally prohibited. Cross-connection controls are already embodied in Regulation 84, including equipment requirements, recycled water signage and markings, inspections and training programs, and compliance with applicable code requirements.

Table 2 Additional Conditions Required Under Regulation 84

Exposure Route	Additional Conditions Required[(1)]	Reg. 84 Section
Personal Exposure	• Signage. • Worker training.	84.9(C)(3) 84.9(C)(10)
Ingestion	• Reclaimed water not to be sprayed on undesignated areas such as occupied buildings, domestic drinking water facilities, or facilities where food is being prepared for human consumption.	84.9(C)(2)
Inhalation	• If aerosol drift from cooling towers to public or worker areas is likely, signage is required, and users are to consider supplemental disinfection and chlorine residual and/or public access restrictions.	84.8(A)(1)
Dermal Contact	No additional conditions required.	
Environmental Exposure	• Runoff from concrete mixing and washout must be contained. • Prevent any off-site runoff or ponding. • Workers shall be trained on the proper use of reclaimed water.	84.8(A)(2) 84.8(A)(3) 84.8(A)(5)
Cross-connection	• No reclaimed water piping shall be extended to or supported from any residential structure. • No accessible above-grade outlets from the reclaimed water system at any residential structure. • Strictly prohibit cross-connections between the reclaimed water and potable water systems. • Cross-connection inspection programs. • Approved backflow prevention device or cross-connection control method at all potable water service connections.	84.8(A)(4) 84.8(A)(5) 84.9(C)(5)

Notes:
(1) Not all Additional Conditions are required for each use. Refer to Regulation 84 Table A and Sections 84.8 and 84.9.

1.4 Study Overview

This analysis describes the level of potential human and environmental exposure and recommends requirements for protection of public health and the environment for these new uses. Based on the risk analysis, this study recommends a minimum water quality and treatment requirement for each of the three new proposed uses and analyzes what, if any, conditions of use specific to each use are warranted to mitigate risks that are not already mitigated by the use of the treatment and water quality requirements of the specified reclaimed water category.

A weight-of-evidence approach was used to provide multiple bases of information for this analysis. These include:

- Water Use and Exposure Characterization (Section 2): Field investigations of water use in vehicle washes and commercial laundries in Denver Water's service area that are currently served by potable water, to characterize the use of water and potential human and environmental exposure pathways to water.
- Regulatory and Guidance Precedents (Section 3): A review of regulatory and guidance precedent in the United States, including several states that formally authorize recycled water use for vehicle washing and/or commercial laundries, and a comparison of the proposed uses to existing authorized uses under Regulation 84.
- Case Studies of Existing Recycled Water Use (Section 4): Case studies of existing users of recycled water for vehicle washes and commercial laundry facilities in other states that authorize recycled water for those uses.
- Relative Risk Evaluation (Section 5): A relative risk evaluation to assess the potential for human and environmental exposure for each use, and to characterize the key parameters of concern relative to Colorado's recycled water criteria, typical recycled water quality, and water quality in existing facilities served by potable water.
- Conclusions (Section 6): Synopsis of the findings from these analyses, using a weight-of-evidence approach.
- References (Section 7).
- Appendices:
  - Appendix A: Proposed Statement of Basis and Purpose Language for Regulation 84 for Vehicle Washing and Commercial Laundry Uses.
  - Appendix B: Case Study Documentation on Users of Reclaimed Water in Vehicle Washing and Commercial Laundry Operations.

2.0 WATER USE AND EXPOSURE CHARACTERIZATION

As part of this study, representative existing commercial laundry and vehicle washing facilities in Denver Water's service area were toured to investigate the potential for personal exposure, environmental exposure, and cross-connections associated with the potential future use of reclaimed water.

Each of these facilities is currently served by potable water for all of the facilities' water use and each is a potential candidate for conversion to reclaimed water. The site visits focused on characterizing how water is used in each facility, with an emphasis on identifying human and environmental exposure pathways for the water in use at each facility. Those findings are summarized in this section of the report.

2.1 Commercial Laundries

In commercial laundry facilities, workers process linens, clothing, and other textiles in sorting, washing, pressing, and folding operations. Examples of the types of products cleaned at commercial laundries are hospital bed linens, hospital staff and patient clothing (e.g., gowns, scrubs), restaurant staff uniforms, and hotel staff uniforms, towels, and linens. The definition for "Commercial Laundry" proposed for inclusion in Regulation 84 is:

> *"Commercial Laundry means a facility that uses water to clean clothing and other textile products where only laundry workers operate the washing machines and cleaning equipment, where there is no public exposure to reclaimed water under normal operations and only limited and controlled contact with reclaimed water by trained workers."*

Project representatives from Denver Water and Carollo Engineers toured two major commercial laundry facilities in Denver Water's service area as part of this project. Each facility uses a variety of washing, pressing, and folding equipment to process their customers' textile products. Laundered products leave the facility dry, thus avoiding any potential exposure of the laundries' customers to water used in the cleaning process. The facilities toured differ somewhat in their customer base (e.g., hospital focus, versus hotel and restaurant and other industries) and in the level of automation used to move product into and out of each step in the cleaning, pressing, and folding process.

2.1.1 Process Overview

Generally, commercial laundry operations consist of the following steps:

- Manual sorting of incoming product;
- Washing in one or more washing machines/equipment, and removal of excess water through spin or pressing cycles;
- Drying; and
- Pressing and/or folding and preparation for shipment to customers.

The damp product is transferred either manually or automatically from the washing process after the spin cycle to the pressing equipment where it is then manually loaded onto the equipment. Depending on the facility and its procedures and equipment, dry and damp product can be moved from one process area to the next either manually or via automated conveyor systems.

Process water use in commercial laundry facilities occurs nearly exclusively within enclosed processing equipment (e.g., washers), with little or no direct access or contact between workers and the water. Process water is preconditioned prior to being used in the washing operation. Each of the facilities visited pre-treats incoming potable water with a softening process to remove hardness. The incoming water also typically goes through onsite closed-loop heat exchangers to recover heat from spent water, before the spent water is discharged to the sanitary sewer. A portion of the pre-treated water is taken to boilers to generate steam for use inside processing equipment, and the remainder is used for washing processes. Several chemicals are used within the washing operations, such as detergents and softeners. Bleach and hydrogen peroxide in combination with wash temperatures up to 160 degrees Fahrenheit may be used for disinfection and cleaning.

Other water uses observed in the facilities include domestic uses in office areas (e.g., toilets, sinks), cart washing using manual spray wands, and emergency eyewash and shower facilities. These would not be connected to reclaimed water supplies, and would continue to be served with potable water in separate piping systems.

Many commercial laundry facilities have made efforts to reduce water use in their processes in support of economic and sustainability benefits. Both of the commercial laundry facilities visited as part of this study use internal water recycling systems to reduce potable water use. Typically, first-use wash water is used in final rinse steps, and then internally recycled for use in the initial rinsing stages of the washing process, from where it is then discharged to the sanitary sewer. This practice results in the highest water quality near the worker exposure locations.

2.1.2 Human and Environmental Exposure Potential

Table 3 summarizes the assessment of human and environmental exposure to process water at the commercial laundry facilities visited as part of this study. At both facilities, process water is piped directly to each point of use in the washing and pressing process. Personal exposure and access to process water was therefore extremely limited.

Observations and conversations were made with respect to potential ingestion, inhalation, and dermal contact with process water, and with respect to the potential for cross-connections with the potable water system and runoff or other releases to surface water or groundwater.

Table 3 Exposure Assessment of Commercial Laundry Facilities Visited			
Exposure Route	**Process Analysis**	**Exposure Potential[(1)]**	**Suggested Best Management Practice**
Personal Exposure			
Ingestion	• Process water piped directly to washing and pressing processes. • Process water used to manually wash out laundry carts with hose and nozzle.	• None • Moderate	• Signage and training. • Use potable water for cart rinse operation.
Inhalation	• No steam within the workers' work spaces. • No aerosols generated in the facility. • Steam generated in boilers is fully captured in closed-loop piping systems.	None	None
Dermal Contact	• Handling of washed and pressed, damp product: exposure to minimal quantity of water.	Low	None
Environmental Exposure	• All process water is contained within the facility. • Process water is discharged to the sanitary sewer.	None	Prohibit ponding on or runoff from area approved for use (84.8(A)(3)).
Cross-connection	• Process water already separated from potable piping, but may be located within same vicinity.	Moderate	See Conditions for Use of Reclaimed Water (84.9).
Notes: (1) Exposure potential is a relative ranking based on field observations.			

The only contact observed between workers and process water was the handling of damp product in facilities or areas where manual processes are used to move dewatered product from washing to pressing or drying equipment (after spinning/pressing it inside the washing equipment). Some workers at one facility were observed using gloves when handling damp product, which was not required by the facility owners but was reportedly used at the discretion of each worker to reduce dermal abrasion associated with repeated handling of damp material.

No opportunities for incidental ingestion of process water were observed during the laundry wash process, consistent with the commercial/industrial nature of the operations and the closed-loop nature of the piping systems. If reclaimed water were used in place of potable water, signage and training would be used to inform workers of the relative water quality and the prohibition against ingestion and cross-connections. Process water is already dedicated to non-potable uses in the facilities visited as part of this study; cross-connection protection would be further afforded by using the protocol already specified in Regulation 84.

Minor amounts of steam were observed to be rising above certain pieces of processing equipment, but in minimal amounts that visually dissipated within a few feet directly above the equipment. No steam was observed within the workers' immediate workspaces. Steam generated in boilers for process use is intentionally fully captured in closed-loop piping systems. No other aerosols or water vapor that could potentially be inhaled were observed at the facilities.

All process water is contained within the facility, mitigating any potential for environmental releases to ambient surface water or groundwater. At the two facilities toured as part of this project, all process water is discharged to the sanitary sewer. As with existing approved uses of reclaimed water under Regulation 84, offsite runoff from commercial laundry facilities will be expressly prohibited, even though there is little risk or potential for this to occur due to the closed-loop nature of piping systems typically found in these operations.

2.2 Automated Vehicle Washing

Automated vehicle washing facilities are those where automated equipment is used to spray water, soap, and/or other wash chemicals onto vehicles and where brushes or other automated mechanical equipment are used to clean vehicles as they pass through the washing facility. Automated vehicle washing includes private facilities not open to the public (e.g., a rental car operation's car washing facility) and those that are open to the public. The definition for "Automated Vehicle Washing" proposed for inclusion in Regulation 84 is as follows:

> *"Automated Vehicle Washing means the cleaning of vehicles and associated equipment, such as trailers, where automated equipment is used to apply spray water, cleaning products, and/or rinse water, where there is no public exposure to reclaimed water under normal operations and only limited and controlled contact with reclaimed water by trained workers."*

Project representatives from Denver Water and Carollo Engineers toured five automated vehicle washing facilities in Denver Water's service area as part of this project.

2.2.1 Process Overview

Automated vehicle washing equipment can use different combinations of equipment and process steps to clean vehicles as they pass through the cleaning process. Generally, the processes include one or more of the following washing steps:

- Pre-rinse with water;
- Application of soaps or other wash chemicals;
- Mechanical brushing in combination with water spray from nozzle racks;
- Final rinse; and
- Air blowers for drying.

The vehicles are driven through the automated vehicle wash facilities by either an employee or the public owner of the vehicle. In some facilities, vehicles are moved through automated washing equipment using a conveyor system. At some facilities, vehicles are pre-washed manually using hoses or wands to spray water and/or soap onto the vehicles and/or manually brushed before entering the automated equipment. Manual pre-wash operations would either remain on potable water supply or instead be classified as a Manual Non-Public Vehicle Washing facility under the proposed new uses for Regulation 84.

Water running off vehicles in the automatic vehicle wash bay is typically directed to floor drains through sloped impervious surfaces (e.g., concrete) and collected in a sump, from where it is either internally recycled or discharged to the sanitary sewer. Many vehicle washing facilities, including all of the facilities toured as part of this study, have installed internal water recycling systems to reduce water use and associated costs. Recycling systems typically include coarse screening to remove larger particles and debris, storage of internally-recycled water, and pumping of internally-recycled water back to the spray nozzle racks. Internal recycling systems are augmented with potable water supplies to make up for losses due to evaporation, discharges to sanitary sewers, or carryout of water on vehicles. Facility operators reported that internal-recycle sumps and tanks are periodically maintained to remove accumulated sediment and debris, with the frequency of such-cleanouts varying seasonally (e.g., higher frequency in winter months with accumulation of road maintenance materials such as sand and deicing chemicals).

One of the facilities visited reported using potable water (plumbed separately from the internal recycle water) for final rinsing to reduce the potential for spotting on the cars that might otherwise occur if the final rinse was supplied with internally recycled water.

2.2.2 Human and Environmental Exposure Potential

Table 4 summarizes the assessment of the human and environmental exposure to process water at the automated vehicle wash facilities visited as part of this study.

The automated vehicle washing facilities visited each have process water piped directly to the point of use at the nozzles of the car wash racks. The potential for personal exposure and access to process water in the facilities is therefore extremely limited. Within the automated vehicle washing process there is little or no possibility for workers or the public to come into contact with water in the vehicle washing facility. Other than the driver of the vehicle (inside the vehicle and physically isolated from the wash water), personnel are not present in the wash bay during washing operation for reasons of both physical safety and comfort.

No opportunities for incidental ingestion of process water were observed, consistent with the commercial/industrial nature of the operations. Similarly, there was no opportunity for dermal contact with wash water in the facility, since users were in their vehicles during washing operations. If reclaimed water were used in place of potable water, signage and training would be used to inform workers of the relative water quality and the prohibition against ingestion and cross-connections. Public users of automated vehicle washes would not normally have access to plumbing or direct access to washing equipment, as they stay within their vehicles or in separate waiting areas throughout the washing process.

Process water is already dedicated to non-potable uses in the facilities visited as part of this study. Backflow prevention devices were observed at each vehicle washing facility, separating potable supplies from vehicle washing process piping. Signage and labeling prevalent at each of the automated vehicle washing facilities was posted indicating that the process water downstream of the backflow prevention device is non-potable. Cross-connection protection would be further afforded by using the protocol already specified in Regulation 84.

Aerosols were observed to be generated by the vehicle wash spraying and brushing process. In one facility, aerosol drift was observed to pass intermittently beyond the extent of the washing equipment. Aerosols may have the potential to drift to worker and/or public areas, depending on facility layout, operations, and ambient wind conditions. The duration of exposure to aerosols could include intermittent contact throughout the course of a typical workday.

Table 4 Exposure Assessment of Automatic Vehicle Washing Facilities Visited

Exposure Route	Process Analysis	Exposure Potential[(1)]	Suggested Best Management Practice
Personal Exposure			
Ingestion	• Process water piped directly to the point of use at the nozzles of the car wash racks. • Personnel not present in the wash bay during washing operation.	None	Signage and training.
Inhalation	• Aerosols generated by the vehicle wash spraying and brushing process. • Aerosol drift can pass into worker and/or public areas.	Moderate	High-level disinfection of reclaimed water, or prevent exposure to aerosols.

Table 4 Exposure Assessment of Automatic Vehicle Washing Facilities Visited			
Exposure Route	**Process Analysis**	**Exposure Potential[(1)]**	**Suggested Best Management Practice**
Dermal Contact	• Users / employees remain in vehicles during washing operations. • No public access to plumbing or washing equipment. • Equipment maintenance conducted when vehicle wash not in operation.	None	None
Environmental Exposure	• Wash water captured in sumps, wastewater discharged to sanitary sewer. • Vehicles exiting the washing process carry out minor amounts of water via drippage.	Low	Prohibit ponding on or runoff from area approved for use (84.8(A)(3)).
Cross-connection	• Process water already separated from potable piping, but may be located within same vicinity. • Backflow prevention devices already in place. • Signage and labeling indicating process water is non-potable already posted.	Low	See Conditions for Use of Reclaimed Water (84.9).
Notes: (1) Exposure potential is a relative ranking based on field observations.			

Vehicle washing facilities—including those using potable water supplies—are already required to contain all vehicle wash water onsite. Each of the facilities toured as part of this study captured wash water in sumps, employed internal recycling of water, and discharged any excess water to the sanitary sewer. Vehicles exiting the washing process were observed to carry out minor amounts of water via drippage from the wet vehicles, with some wetting of the pavement occurring. However, vehicle washing facilities are already required to prevent runoff of wash water to waters of the state, regardless of the source of the water.

This is typically accomplished by sloping capture areas to a trench drain or sump for internal recycle or sanitary sewer discharge. Prevention of offsite runoff is included as an Additional Condition in the proposed Regulation 84 language for Automated Vehicle Washing.

2.3 Manual Non-Public Vehicle Washing

Manual non-public vehicle washing facilities are those where manual equipment is used to spray water, soap, and/or other wash chemicals onto vehicles and where brushes or other manually operated mechanical equipment may be used to clean vehicles. Approval for recycled water use is only being sought for manual vehicle washing facilities that are not open to or accessible by the public. This provides an enhanced level of protection for human health and the environment, because workers can be informed and trained on the proper use and controls on the use of recycled water in the process. The definition for "Manual Non-Public Vehicle Washing" proposed for inclusion in Regulation 84 is as follows:

> *"Manual Non-Public Vehicle Washing means the cleaning of vehicles and associated equipment, such as trailers, where any or all of the following are applied manually in the cleaning process: spray water, cleaning products, and/or rinse water; where there is no public access to the vehicle washing facility and only limited and controlled contact with reclaimed water by trained workers."*

Project representatives from Denver Water and Carollo Engineers toured two manual vehicle washing facilities as part of this project.

2.3.1 Process Overview

Manual vehicle washing can include the use of manually operated hoses, low- or high-pressure wands, and brushing and other cleaning equipment to clean vehicles. In some cases, manually operated cleaning can occur at facilities where automated vehicle washing equipment is also in use. Water management is essentially identical to that at automated vehicle washing facilities, and many facilities include internal water recycling systems.

The manual vehicle processes may include one or more of the following washing steps:

- Pre-rinse with water,
- Application of soaps or other wash chemicals (e.g., degreaser),
- High-pressure wash with wand (wash water may be heated),
- Optional low-pressure wash with acid/water blend, and
- Final rinse.

The vehicles are driven into the area where the washing takes place. Water running off vehicles in the automatic vehicle wash bay is typically directed to floor drains through sloped impervious surfaces (e.g., concrete) and collected in a sump, from where it is either internally recycled or discharged to the sanitary sewer.

2.3.2 Human and Environmental Exposure Potential

Table 5 summarizes the assessment of the human and environmental exposure to process water at the manual vehicle wash facility visited as part of this study.

Ingestion of water is unlikely in manual vehicle washing facilities due to the commercial/industrial nature of the use. However, personal access and exposure to water in the washing facility, both as liquid and aerosols, is greater than with automated vehicle washes because of the manual application of water to vehicles. Additional conditions associated with labeling, signage, and worker training that are already embodied in Regulation 84 will be required for manual vehicle washing operations to further protect against the potential for incidental ingestion of water.

Depending on the water application equipment in use, aerosols can be generated in close proximity to the wash operator, and water can also splash back toward the operator. At the two facilities visited as part of this study, one employed no additional protective clothing or equipment for wash operators. The other employed the use of a face shield and clothing to reduce the worker's contact with the wash water. At that facility, the equipment was intended to prevent physical contact due to high-pressure washing and the use of acid in the washing process; the equipment was not geared toward prevention of aerosol inhalation.

The cross-connection potential in these systems is similar to that at automated vehicle washing facilities, and will be controlled using Additional Conditions and the cross-connection prevention measures already embodied in Regulation 84.

Table 5 Exposure Assessment of Manual Non-Public Vehicle Washing Facilities Visited

Exposure Route	Process Analysis	Exposure Potential[(1)]	Suggested Best Management Practice
Personal Exposure			
Ingestion	• Personal access to process water because of the manual application. • Ingestion of water unlikely due to the commercial/industrial nature of the use.	Low	Labeling, signage, and worker training.
Inhalation	• Aerosols generated by the vehicle wash spraying and brushing process. • Aerosol exposure for workers washing vehicles.	Moderate	High-level disinfection, or prevent exposure via containment of aerosols and/or personal protective equipment.

Table 5 Exposure Assessment of Manual Non-Public Vehicle Washing Facilities Visited			
Exposure Route	**Process Analysis**	**Exposure Potential[(1)]**	**Suggested Best Management Practice**
Dermal Contact	• Dermal contact possible for workers washing vehicles; workers typically wear clothing to minimize direct dermal contact with wash water.	Moderate	None
Environmental Exposure	• Wash water captured in sumps, wastewater discharged to sanitary sewer. • Vehicles exiting the washing process carry out minor amounts of water via drippage.	Low	Prohibit ponding on or runoff from area approved for use (84.8(A)(3)).
Cross-connection	• Process water already separated from potable piping, but may be located within same vicinity. • Backflow prevention devices already in place. • Signage and labeling indicating process water is non-potable already posted.	Low	See Conditions for Use of Reclaimed Water (84.9).
Notes: (1) Exposure potential is a relative ranking based on field observations.			

2.4 Summary

The characterization of the three proposed uses revealed that the inhalation of aerosols at vehicle washing facilities presents the most likely route of human or environmental exposure to recycled water. No significant personal or environmental risks were identified at commercial laundry facilities. Ingestion of recycled water is prohibited and unlikely in these commercial/industrial-type applications, and is mitigated through the use of standard additional conditions in Regulation 84. Dermal contact is minimal in each proposed use. Cross-connections, while a potential concern, are mitigated through the use of standard additional conditions in Regulation 84 and are already mitigated in many existing facilities through the use of backflow prevention systems. Lastly, environmental releases are already

prohibited from facilities fed by potable supplies, and will continue to be prohibited through standard language already contained in Regulation 84 Conditions of Use.

In light of these conclusions, the remainder of the analyses conducted in this study focused primarily on an analysis of the human health risks associated with inhalation of aerosols at vehicle washing facilities.

2.5 Comparison of Exposure Potential to Existing Approved Uses in Regulation 84

The exposure potential described above for the proposed commercial laundry and vehicle washing uses of reclaimed water were compared to that of existing approved uses under Regulation 84. This provides a consistent frame of reference for evaluating the human health and environmental risks of the proposed new uses compared to the current reclaimed water uses in Colorado.

The previously approved Commercial and Industrial uses under Regulation 84 include Mechanized Street Cleaning, Zoo Operations, Cooling Tower, Concrete Mixing and Washout, Dust Control, Soil Compaction, and Closed Loop Cooling System. Each of the previously approved Commercial and Industrial uses is approved for use with Categories 1, 2, and 3 water in Regulation 84.

Provided that the existing conditions of use in Regulation 84 are employed (e.g., signage, worker training), the potential for human contact (ingestion, inhalation, dermal contact) with reclaimed water use at commercial laundries will be comparable or lower than for the previously approved Commercial Uses and Industrial Uses approved under Regulation 84.

For automated vehicle washing facilities, the potential for ingestion and dermal contact is minimal, and is comparable to or lower than the previously approved Commercial and Industrial Uses. As discussed earlier, there is a potential for inhalation of aerosols in worker or public areas adjacent to automated vehicle washing wash bays if aerosols generated during the washing procedure are not contained in enclosed areas. In this case, the potential for inhalation could be higher compared to some existing outdoor uses (e.g., Cooling Tower, Concrete Washout, or Landscape Irrigation), but appear comparable to other authorized uses (e.g., Zoo Operations, which is allowed for use with Categories 1, 2, or 3 water). If the aerosols are contained within the immediate automated vehicle wash area, the potential for inhalation with reclaimed water use at automated vehicle washing facilities is comparable or lower than for the existing commercial and industrial uses.

As previously discussed, manual vehicle washing facilities have a low potential for ingestion or significant dermal contact. Due to the potential high pressure wash operation, the close proximity of the worker to the point of use, and the frequency and duration in which workers are conducting vehicle wash operations, the potential exposure to aerosol inhalation is higher than many previously-approved uses.

3.0 REGULATORY AND GUIDANCE PRECEDENTS

This chapter provides an overview of precedents established in federal and state regulations and guidance as they apply to commercial/industrial reuse applications like vehicle washes and commercial laundries. This includes a review of several existing state and federal standards, regulations, and guidelines.

3.1 EPA Guidelines for Water Reuse

There are no federal rules or enforceable standards regarding the treatment, distribution, or use of reclaimed water. However, the U.S. Environmental Protection Agency (EPA) has provided guidance on the topic since 1980. In Fall 2012, EPA published a major update of its *Guidelines for Water Reuse* (2012 EPA Guidelines, USEPA, 2012). The 2012 EPA Guidelines are often used to provide guidance in areas where no state regulations or guidelines exist. In its guidelines, EPA included a discussion on expanding opportunities for reuse, provided treatment recommendations for specific use categories, and gave an overview of individual states' reuse regulations. Relevant sections of the EPA Guidelines are discussed here in the context of the proposed commercial laundry and vehicle washing uses in Colorado – a state that does have an existing reuse regulatory program, but does not currently authorize these uses.

3.1.1 Categories and Risks for Vehicle Washing and Commercial Laundry Uses

In the 2012 EPA Guidelines, vehicle washes and commercial laundries are mentioned in several places in the document and fall under the definition of Restricted Urban Reuse (USEPA 2012, pp. 1-4):

> *"The use of reclaimed water for nonpotable applications in municipal settings where public access is controlled or restricted by physical or institutional barriers, such as fencing, advisory signage, or temporal access restriction."*

This definition is applicable to Colorado's proposed commercial laundries and non-public manual vehicle washing uses, as these facilities are not open to the public but are instead operated by employees of the businesses that would use recycled water. It is also applicable to automated vehicle washing, both in business applications where there is no public access, and in publicly-accessible vehicle washing facilities, as there is a physical barrier between public users of automated vehicle washing facilities and the wash water That is because users either stay in their vehicle throughout the washing process, or are outside the vehicle and away from the automated washing equipment for reasons of safety and comfort.

The 2012 EPA Guidelines focus on ingestion and inhalation as the primary pathways for potential human exposure to recycled water. From page 6-6 of the guidelines:

> "*The main potential routes of waterborne disease transmission, in the context of water reclamation, include ingestion or consumption of contaminated water or foods from vectors via hand-to-mouth contact, or by inhalation from breathing in a mist or aerosolized water containing suspended pathogens. The potential transmission of*

infectious disease by pathogenic agents is the most common concern associated with reuse of treated municipal wastewater."

Ingestion is not considered to be a significant exposure pathway for commercial laundries or vehicle washing uses of recycled water, in part due to the nature of the operations, and in part due to the Additional Conditions specified in Regulation 84 that are targeted toward prevention of ingestion of recycled water (see Section 2). Exposure to inhalable aerosols, in contrast, was found to be a more likely exposure pathway for vehicle washing uses, in particular for manual operations.

Also noteworthy is that EPA's suggested guidelines for Unrestricted Impoundments (defined as "The use of reclaimed water in an impoundment in which no limitations are imposed on body-contact") are essentially the same as those for Unrestricted Urban Use in terms of treatment processes (secondary, filtration, and disinfection) and water quality. This suggests that water meeting the Unrestricted Urban Reuse guidelines is of such high quality that the public could literally swim in it, with no unacceptable risks to human health.

3.1.2 Mitigation of Aerosol Inhalation Risks

Protection of human health relative to inhalation of aerosols is addressed in several sections of the EPA Guidelines. The 2012 EPA Guidelines indicate that inhalation of aerosols presents human health risks for undisinfected or improperly disinfected recycled water. One example of this is the following quotation from page 6-7 of the Guidelines (emphasis added).

> *"Aerosols are particles less than 50 µm in diameter that are suspended in air. Viruses, most pathogenic bacteria, and pathogenic protozoa are in the respirable size range; hence, inhalation of aerosols is a possible direct means of human infection. Aerosols are most often a concern where improperly treated reclaimed water is applied to urban or agricultural sites with sprinkler irrigation systems or where it is used for cooling water make-up. Infection or disease may be contracted directly through inhalation or indirectly from aerosols deposited on surfaces, such as food, vegetation, and clothes. The infective dose of some pathogens is lower for respiratory infections than for infections via the gastrointestinal tract; thus, for some pathogens, inhalation may be a more likely route for disease transmission than either contact or ingestion. Thus, for intermittent spraying of disinfected reclaimed water, occasional inadvertent contact should pose little health hazard from inhalation. Cooling towers issue aerosols continuously and may present a greater concern if the water is not properly disinfected."*

The *2012 EPA Guidelines* recommend aerosol control for water that is minimally disinfected. Page 4-14 states (emphasis added) that "*In irrigation, the general practice is to limit, through design or operational controls, exposure to aerosols and windblown spray produced from reclaimed water that is not, or only minimally, disinfected.*" It does not state that all exposure to aerosols should be limited, nor does it state that exposure to aerosols should be limited when the reclaimed water is highly disinfected.

Consistent with this finding, the EPA Guidelines and many states' regulations do not require filtration or high-level disinfection (i.e., non-detectable or near-non-detectable levels of indicator organisms) for cooling towers, instead specifying BMPs for mitigating aerosol inhalation risks for cooling tower use.

The EPA Guidelines' suggested guidelines for Once-through Cooling and Recirculating Cooling Towers include secondary treatment and disinfection with a maximum of 200 fecal coliform per 100 mL (comparable to Colorado's Category 2 limit, see Table 1). Both cooling tower uses have suggested EPA Guidelines that state "*Windblown spray should not reach areas accessible to workers or the public*." The previously-approved cooling tower use in Regulation 84 follows this precedent, allowing the use of Categories 1, 2, or 3 water for Evaporative Industrial Process (formerly named Cooling Tower) use but specifying aerosol risk mitigation via additional conditions at 84.8(A)(1).

In California, aerosol drift from cooling towers must be managed, but no aerosol control BMPs are specified for vehicle washing uses other than prevention of aerosol drift to dwellings or food preparation/consumption areas (California Code of Regulations, Title 22, Article 3, Section 60310). The Final Statement of Reasons for California's area of use restrictions at Section 60310 states (emphasis added): *"This subsection would provide assurance that mist or spray from an irrigation project that uses recycled water, other than disinfected tertiary recycled water, does not come into contact with sensitive areas where children or other vulnerable members of the public may be exposed."* While this statement of reason is for irrigation-based "mist and "spray," it suggests that aerosol exposure is only a concern if the reclaimed water is not highly disinfected and filtered.

In contrast, the 2012 EPA Guidelines and several states' regulations (as cited in the 2012 EPA Guidelines and described further in Section 3.3 of this report) do specify filtration and high-level disinfection for vehicle washing and commercial laundry uses, with no BMPs for mitigating aerosol inhalation risks (other than prevention of aerosol drift to dwellings or food preparation/consumption areas, similar to Colorado's existing requirements at Section 84.9(C)(2) of Regulation 84).

California's Title 22 Code of Regulations authorizes the use of reclaimed water for commercial laundries and car washes. The Final Statement of Reasons supporting that authorization states that the new uses approved under Section 60307 *"…pose as much risk for public contact with the (reclaimed) water through direct contact, inhalation, or ingestion, as (irrigation)…*" (California Code of Regulations, Title 22, Article 3, Section 60307). California requires filtration and high-level disinfection for commercial laundries and vehicle washing, but neither filtration nor high-level disinfection are required for cooling towers.

In general, EPA recommends that "*where human exposure is likely, reclaimed water should be treated to a high degree prior to its use*" (USEPA 2012, pp. 6-2). The EPA's suggested guidelines for Restricted Urban Reuse are generally consistent with the requirements for Colorado Reclaimed Water Category 2 (i.e., secondary treatment and disinfection, with comparable limits specified for indicator organisms and total suspended solids). However, EPA's Restricted Urban Reuse treatment guidelines note that "*For use in construction activities including soil compaction, dust control, washing aggregate, making concrete, worker contact with reclaimed water should be minimized and a higher level of disinfection*

(e.g., <14 fecal coli/100 mL) should be provided when frequent worker contact with reclaimed water is likely."

This indicates that a level of disinfection higher than that specified for Restricted Urban Reuse is appropriate for situations where there is a likelihood of frequent worker contact. In this case, BMPs should be employed to prevent frequent worker exposure (e.g., physical barriers between aerosol sources and humans, personal equipment to prevent aerosol inhalation, or other approved means) if less stringent disinfection is employed. This supports an approach where aerosol inhalation risks are mitigated either through:

- Use of high-level disinfection (i.e., Colorado Reclaimed Water Category 3), or
- Use of lower-level disinfection (i.e., Colorado Reclaimed Water Category 2) with BMPs to prevent frequent inhalation of aerosols.

The review of the 2012 EPA Guidelines relative to the proposed uses supports the following conclusions:

- Secondary treatment and disinfection are appropriate treatment requirements for the proposed commercial laundry and vehicle washing uses.
- Inhalation of aerosols is of concern when recycled water is not adequately disinfected, but does not pose a significant human health risk when recycled water is highly disinfected.
- With use of Category 3 water for the proposed uses, workers and the public can be exposed to recycled water through inhalation and dermal contact with no requirement to prevent such exposures.
- Alternatively, water not meeting the Category 3 disinfection requirements could be used for the proposed uses, provided that BMPs were employed to prevent frequent inhalation of aerosols (e.g., physical containment of recycled water aerosols or use of personal protective equipment (PPE)).

Thus, Category 2 Reclaimed Water is appropriate for manual and automated vehicle washing facilities and commercial laundries, if the exposure of workers or the public to aerosol drift is infrequent or prevented through BMPs (e.g., physical barriers or personal equipment). If frequent human exposure to recycled water or aerosols is expected, and is not prevented through physical barriers or personal equipment, higher-level disinfection via use of Category 3 Reclaimed Water is an appropriate mitigation for the aerosol inhalation risk. These recommendations are summarized in Table 6.

Table 6 Recommended Reclaimed Water Categorizations for Proposed New Uses		
Use	**Category 2 Water Quality**	**Category 3 Water Quality**
Commercial Laundries	Allowed. If frequent personal exposure, Additional Conditions (BMPs) are required to minimize inhalation exposure.	Allowed. No Additional Conditions are required for prevention of aerosol exposure.
Automatic Vehicle Washing		
Manual Non-Public Vehicle Washing		

3.2 Occupational Safety and Health Act

Worker health and safety in the workplace is under the purview of the Occupational Safety and Health Act (OSH Act) of 1970. It covers all private sector working conditions that are not addressed by safety and health regulations of another federal agency under other legislation. The intent of the OSH Act is to "assure safe and healthful working conditions for working men and women." Under the OSH Act, employers are responsible for providing a safe and healthful workplace.

The OSH Act led to the creation of the Occupational Safety and Health Administration (OSHA). Its mission is to assure safe and healthful workplaces by setting and enforcing standards, and by providing training, outreach, education, and assistance. The OSH Act allows for state-led safety and health programs as long as those programs are at least as effective as the federal program (Section 18). Colorado has not developed its own job safety and health program. Therefore, in Colorado, the Colorado Department of Public Health and Environment (CDPHE) regulates the treatment and use of reclaimed water, while occupational safety is regulated, enforced, and administered by OSHA under federal jurisdiction.

CDPHE monitors work-related injuries, illnesses, and fatalities through the Occupational Health and Safety Surveillance Program. It is recommended that if workplace hazards are of particular concern with a reuse application, the permit writer may confer with Colorado's OSHA for additional guidance. An inquiry with OSHA in Colorado revealed that OSHA does not have rules specific to recycled water uses. OSHA sets "permissible exposure limits" (PELs) for worker exposure to chemical substances and physical agents. PEL air standards have been set for "toxic and hazardous substances," which includes organic and inorganic chemicals but not biological contaminants.

Guidance is provided to certain industries regarding management of microbial hazards (e.g., for hygiene workers), but there are no guidance documents with relevance to car washes or laundries using recycled water. OSHA has established an alliance with the International Car Wash Association to "*provide members of the professional car wash/car care industry…with access to information, guidance, and access to training resources that will help them protect employees' health and safety.*" The focus of this alliance is on reducing and preventing exposure to workplace hazards associated with slips, trip and falls, hazard communication, and

vehicle operation safety, as the chief concern in car washes are physical hazards associated with the movement of cars and the washing equipment. Inhalation risks are not addressed.

Per information from OSHA in Colorado, in cases where a concern is raised without specific rules in place, OSHA reserves the right of a review under the general duty clause 5 (a) (1) stating that "*each employer shall furnish to each of his employees employment and a place of employment which are free from recognized hazards that are causing or are likely to cause death or serious physical harm to his employees.*" In such an instance, OSHA would investigate whether hazardous conditions exist for workers and ask the employer to demonstrate that no such conditions are present.

3.3 State Regulations and Guidance

Several individual states' regulations were reviewed regarding the use of reclaimed water for vehicle washing and commercial laundries. The regulations from nine states that currently have existing authorized uses for either one or both of the proposed new uses are summarized in Table 7. This list is not intended to be inclusive of all states that authorize the use of reclaimed water, but rather provides insights into practices and requirements in other states specific to vehicle washing and commercial laundry uses.

Similar uses have been in place in states like California and Florida for years. The 2012 EPA Guidelines cite a recent National Research Council (NRC) report on reuse (NRC 2012) providing a historical perspective on the safe track record of reuse systems in the United States. The NRC's analysis of epidemiological data found no trends in health issues with historical reclaimed water use in the United States. From page 6-1 of the 2012 EPA Guidelines:

> *"There have been hundreds of reuse projects implemented in the United States for various end uses and these projects, cumulatively, have demonstrated that use of properly treated reclaimed water meeting cross connection controls and use area requirements is protective of human health and the environment. While specifically proving the negative is difficult, i.e., that there have not been human health or environmental impacts associated with use of reclaimed water, at least one report notes that, 'There have not been any confirmed cases of infectious disease that have been documented in the U.S. as having been caused by contact, ingestion, or inhalation of pathogenic microorganisms at any landscape irrigation site subject to reclaimed water criteria' (WRRF, 2005). Further, with respect to chemical hazards and risks, the NRC reports that, 'To date, epidemiological analyses of adverse health effects likely to be associated with use of reclaimed water have not identified any patterns from water reuse projects in the United States' (NRC, 2012)."*

3.3.1 Water Quality Criteria for Vehicle Washing and Commercial Laundries

Of the nine states reviewed, all allow at least one of the proposed uses. Five of the states reviewed allow recycled water use in commercial laundries. Eight of the states reviewed allow vehicle washing facilities to employ recycled water. None of these eight states differentiates between automated and manual vehicle washing. Oklahoma is the only state that generally excludes self-service carwash stations.

Other states' requirements for treatment and reclaimed water quality for commercial laundry and vehicle washing uses were compared to Colorado's reclaimed water categories (Table 1) to provide a frame of reference. All nine states require secondary treatment followed by filtration and high-level disinfection for car washes and laundries, specifically, and for reuse applications with unrestricted public access in general. A few of the states reviewed (Idaho, Oklahoma, Washington) require additional levels of treatment that includes coagulation. In terms of turbidity and microbial water quality requirements, all nine states require a reclaimed water quality for vehicle washing and/or commercial laundries that is comparable to Category 3 water quality in Colorado Regulation 84 (see Table 7).

3.3.2 Basis for Other State Regulations

Generally, little documentation is published regarding the basis for authorization of recycled water uses in other states' regulations. The California Department of Public Health (CDPH) followed a general principle of implementing stringent treatment and water quality requirements that are designed to be protective of public health. The filtration and disinfection requirements outlined in the regulations were developed to achieve this. California's reuse regulations are based on the consideration of both bacteria and enteric viruses (Kiado, 1994), even though only total coliform standards are listed in the regulations. Tertiary treatment was required for urban reclaimed water applications to "assure that the concentration of enteric viruses in reclaimed water…will be lower than the detection limit of 1 virus unit/100 mL (pp. 5, Kiado, 1994). This resulted in an acceptable, annual risk that was deemed "negligible" and defined as 10^{-4} (1 in 10,000) (pp. 8, Kiado, 1994). Florida has similar regulations to California with regard to requirements for vehicle washing and commercial laundry operations. Both states are reported to have an unblemished record of public health protection with respect to reuse (Crook, 2005).

3.3.3 Best Management Practices and Conditions of Use

All nine states reviewed as part of this study specify additional conditions or BMPs for reuse applications in general use areas that differ in the level of detail and extent. Table 7 lists these additional requirements as they pertain specifically to vehicle washing and/or commercial laundry facilities. Based on this review of other states' requirements, the common general best management practices for vehicle washing and commercial laundry uses of reclaimed water are summarized as follows:

- Signage, notifications, and labeling indicating where reclaimed water is used;
- Education of workers and the general public about the use of reclaimed water and applicable best management practices for its use;
- Purple colored pipelines and pipeline labeling to differentiate the reclaimed water lines from potable water and other piping;
- Cross-connection control;
- Prohibiting the use of reclaimed water for hose bib operations; and
- Full containment of reclaimed water (e.g., closed-loop systems or collection and discharge to a sanitary sewer) to prevent runoff to waters of the state.

Table 7 Key Requirements for Vehicle Washing and Commercial Laundries in State Regulations

State	Allowed Uses	Treatment Required	Turbidity Requirements	Microbial Indicators	Additional Requirements / BMPs Applicable to Vehicle Washing/Laundry Uses
Arizona	Vehicle Washing	Secondary treatment, filtration, high level disinfection[1]	2 NTU (24 hr avg.), 5 NTU (max.)	Fecal coliform	• Signage.
California	Commercial vehicle washes, including hand washes if the recycled water is not heated, where the general public is excluded. Commercial Laundry 60307 (a)	Disinfected tertiary: Oxidation, filtration, high level disinfection[2]	2 NTU avg./10 NTU max. for media filters	Total coliform	• Spray, mist, or runoff shall not enter dwellings, designated outdoor eating areas, or food handling facilities. • Drinking water fountains shall be protected against contact with recycled water spray, mist, or runoff. • Signage. • No hose bib connections.
Florida	Vehicle Washing 610.480(2) Commercial Laundry 610.480(2a)	Secondary treatment, filtration, high-level disinfection[3]	Case-by-case, usually 2 - 2.5 NTU	Fecal coliform	• Marking, signing, labeling, or color coding to be used to identify the converted facility as a reclaimed water transmission facility. • Within 100 feet from outdoor public eating, drinking, and bathing facilities, low trajectory nozzles, or other means to minimize aerosol formation shall be used.
Idaho	Vehicle Washing: Case-by-case basis Commercial Laundry	Oxidation, coagulation, clarification, filtration, high level disinfection[4]	2 NTU (24-hour mean) and 5 NTU (max.) for granular/cloth filters	Total coliform	• System identification and signage. • Buffer distances to protect public health determined considering microbial risk assessments, best management practices, environmental conditions, such as wind speed and direction.
North Carolina	Vehicle Washing	Tertiary-quality effluent (filtration or equivalent)[5]	10 NTU (max.)	Fecal coliform or *E. coli*	• Reclaimed water used for activities other than land application shall not be used in a manner that causes exposure to aerosols. • Worker and public information and education.
Oklahoma	Vehicle Washing 252:656-27-1 (1)(F) (Excluding self-service vehicle washes)	Secondary treatment, nutrient removal, coagulation, granular media filtration, disinfection[6]	.	Adenovirus Type 15, *Salmonella, Giardia*	• In relation to irrigation: Systems shall be designed to ensure that direct and wind-blown spray from irrigation systems and other sources are confined to the designated irrigation areas.
Pennsylvania[*]	Vehicle Washing	High level disinfection[7]	≤0.3 NTU, 1 NTU (max.)	Total coliform	• Direct spraying or aerosol transmission of reclaimed water onto any structure or across property lines should be prohibited.
Texas	Vehicle Washing 210.32 (1)(H), Commercial Laundry 210.32(1)(H)	High level disinfection[8]	3 NTU	Fecal coliform or E. *coli*, *Enterococci*	• None.
Washington	Vehicle Washing Commercial Laundry	Oxidation, coagulation, filtration, disinfection	2 NTU (avg.), 5 NTU (max.)	Total coliform: 2.2/100 mL (7-day mean), 23/100 mL (max.)	• Notification and advisory signs. • Precautions shall be taken to assure that reclaimed water will not be sprayed on people or any facility or area not designated for reuse, including but not limited to buildings, passing vehicles, and drinking water fountains.

Notes:

* = state has reuse guidelines, not regulations.

(1) Fecal coliform- none detectable in 4 of last 7 samples, 23/100 mL (max.).

(2) Total coliform - 2.2/100 mL (7-day med), 23/100 mL (not in more than 1 sample/30 days), 240/100 mL (max.).

(3) Fecal coliform- 75% of samples below detection limits (over 30 day period), 25/100 mL (max.).

(4) Total coliform - 2.2/100 mL (7-day median), 23/100 mL (max.).

(5) Fecal coliform or *E. Coli* - 14/100 mL (monthly mean), 25/100 mL (max.).

(6) Removal or inactivation: 5 log Adenovirus type 15; 5 log *Salmonella;* 3 log *Giardia.*

(7) Total coliform - 2.2/100 mL (7-day mean), 23/100 mL (max.).

(8) Fecal coliform or *E. Coli* - 20/100 mL (30-d geo. mean), 75/100 mL (max.); *Enterococci*: 4/100 mL (30-d geo. mean), 9/100 mL (max.).

These practices are generally consistent with the Additional Conditions already specified in Sections 84.8 and 84.9 of Colorado's Regulation 84, with the exception of the categorical prohibition employed by some states to use reclaimed water for hose bibs. As part of the existing regulation, these general requirements and BMPs under Section 84.9 will be applicable to all new authorized uses in Colorado including, if authorized, the proposed commercial laundries and vehicle washing uses.

Most of the state regulations reviewed have general requirements pertaining to the control of aerosol drift in reclaimed water applications (see Table 7). Most state regulations adopted the following requirements:

- Prevent aerosol drift to specific areas, such as designated outdoor eating areas, or food handling facilities.
- Adequate setback distances or buffer zones to contain aerosols to designated areas, and protect public health considering microbial risk assessments, best management practices, and environmental conditions.
- Avoid direct spray of personnel with reclaimed water.

North Carolina is an exception among the reviewed states in that it requires that reclaimed water used for activities other than land application shall not be used in a manner that causes exposure to aerosols, even if high-level disinfection is employed. Florida and California, the two states with numerous long-term users of recycled water in commercial laundries and vehicle washing facilities, differ significantly from North Carolina's requirements. Both states require that aerosol drift is sufficiently contained to prevent deposition on public eating, drinking, and bathing facilities, but do not require avoiding personal exposure to aerosols when high-level disinfected recycled water is used.

Most of the states reviewed here adopt the principle of mitigating inhalation risks entirely through use of high-level disinfection. None of the states reviewed require BMPs such as masks or other PPE to prevent inhalation of aerosols. California's recycled water requirements are currently considered to be the most protective requirements in the nation (USEPA, 2012). Notably, even California's regulations do not prescribe PPE for prevention of aerosol exposure in vehicle washing applications with high-level disinfection.

3.4 Industry Association Guidance

As part of this study, several industry associations for vehicle washing and commercial laundry operations were contacted in Colorado and the U.S. by phone, email, or webpage search to investigate whether any additional industry-specific guidance or requirements have been established for the use of reclaimed water and worker safety. Among these associations were the International Car Wash Association, the Rocky Mountain Car Wash Association, and the Healthcare Laundry Accreditation Council (HLAC), a non-profit organization formed for the purpose of inspecting and accrediting laundries processing healthcare textiles.

No relevant information was received from either Car Wash Association in relation to reclaimed water use. HLAC's webpage publishes the checklist that is used for inspection

and accreditation of laundry facilities processing healthcare textiles. Generally, the focus of the inspection is directed towards the prevention of worker exposure to microbial contamination that originates from the healthcare textiles themselves, e.g., through specific handling requirements, disinfection of the laundry during washing via heat/disinfectants, and other BMPs such as the use of PPE during soil sorting, and general facility cleanliness (HLAC, 2010).

4.0 CASE STUDIES OF EXISTING RECYCLED WATER USE

As part of this study, several case studies were examined, focusing on existing users of recycled water for vehicle washing and commercial laundry facilities in other states that authorize recycled water for those uses. Managers and owners of automated and employee-operated vehicle washes and commercial laundry facilities were contacted by phone to summarize experiences with the use of reclaimed water in these industries. The sites that were contacted were identified using a variety of sources, such as personal knowledge, presenters of topic-related papers given at water industry association conferences, and other referrals from state agencies.

Facility staff were asked general questions such as use name, location, reclaimed water provider, and contact information. Detailed information was gathered during the phone interviews related to the facility process, potential retrofits needed to accommodate reclaimed water use, any additional inspections, or monitoring requirements associated with the conversion from potable to reclaimed water use, and additional service or reclaimed water quality requirements to guarantee customer satisfaction and / or assure public or environmental health.

In total, six facilities in California and Florida were included in this investigation, three vehicle washing operations and three commercial laundries. A brief summary of the sites surveyed is presented in Table 8.

No operational modifications were noted by the laundry facilities or the vehicle wash facilities contacted. Both types of facilities indicated they were already set up with separate piping from the potable systems at the time of conversion to reclaimed water use, preventing a need for major retrofits. In addition, no changes in additives to the water (e.g., detergents, soaps, or other products used) were noted by users of any of the vehicle washing or laundry facilities contacted.

One of the facilities contacted, the vehicle washing operation in Altamonte Springs, Florida (Case Study No. 5) also serves as a provider for reclaimed water. This case study includes their specific experience as a provider and user of reclaimed water. Complete case study summaries are contained in Appendix B. Independent of the type of operation, the operators of all case studies interviewed were very satisfied with the reuse processes in place and emphasized that they have had no issues in converting their systems to recycled water even after extended period of operation.

Table 8 Case Study Summary on Existing Users of Reclaimed Water for Vehicle Washing and Laundries				
Case Study No.	**Type of Use**	**Location**	**Reclaimed Water Use Since**	**Operational Issues Related to Reclaimed Water**
1	Automated Vehicle Wash (buses)	Orlando, FL	1991	None
2	Manual Vehicle Wash (cars)	San Rafael, CA	1989	None
3	Industrial Laundry	Throughout CA	Not in service as of 2012	N/A
4	Industrial Laundry	Ontario, CA	2009	None
5	Automated Vehicle Wash (cars)	Altamonte Springs Utilities, FL	Unknown	None
6	Industrial Laundry	Northern and Southern FL	2002	None

4.1 Vehicle Washing

Three vehicle washing facilities were interviewed, two in Florida and one in California, all with different processes and levels of employee/public access. At none of these facilities do employees near the wash/rinse processes use any PPE specific to handling reclaimed water, nor is any required by regulations (see Section 3).

The Florida vehicle washing facility (Case Study No. 1) is an automated, unmanned facility with limited employee access and no public access (i.e., in a backstage area off of the public access routes, although access is not restricted or fenced) and has been in operation with recycled water for over 20 years. This facility washes over 300 buses daily for Walt Disney World. Minimal retrofits were needed for the conversion to reclaimed water, such as the addition of a drain for the wash water to flow to the sanitary sewer. Aerosol drift was not evaluated in detail since the facility is automated. The facility uses potable water as a final rinse for aesthetic reasons, allaying possible concerns over impacts to paint and finishes on the buses and spotting potential (since reclaimed water total dissolved solids (TDS) concentrations are about twice those of the potable water). Overall, the facility reports that there have been no cases of reported illnesses from exposure to reclaimed water.

The second vehicle washing facility (Case Study No. 2) interviewed is located in San Rafael, California. It washes cars from the general public and has been in service using recycled water for over 20 years. This facility is located at a neighborhood gas station and convenience store. This facility has a very “hands-on” process in which the employees initially hand-rinse the cars, then hand-wash with mitts, soap, and water, and then do a second hand-rinse; all using recycled water. The general public is not allowed access to the process. The facility required no retrofits to convert to recycled water use. The recycled

water provider initially installed an onsite reverse osmosis (RO) unit to help with possible spotting, but when no spotting occurred, this unit was removed, as it was not considered necessary. The vehicle washing facility has been operated using reclaimed water without any further treatment ever since.

Case Study No. 5 represents Altamonte Springs Utilities in Florida that provides reclaimed water and operates an automated vehicle washing operation, with manual drying of the vehicles at the end of the washing process. The only stipulations or BMPs required by Florida regulators were the installation and maintenance of proper signage and backflow preventers on the potable and reclaimed water systems.

4.2 Commercial/Industrial Laundries

Three industrial laundry facilities were contacted as part of this study, the Mission Linen Supply and Cintas Corporation. In addition, the Florida Department of Corrections was interviewed regarding the use of reclaimed water in prison laundry facilities.

Mission Linen Supply (Case Study No. 3) is a major provider of rental products, services, and supplies. Mission Linen Supply was approached by Carollo Engineers in September 2011 regarding using recycled water in the Oxnard, California Mission Linen facility. Mission Linen indicated that its process wash water is completely separate from the potable water systems; therefore, the retrofit to recycled water could be easily achieved. Currently, Mission Linen is not using recycled water in their facilities but would seriously consider it if recycled water was available in its utility service area.

Cintas Corporation (Case Study No. 4) was interviewed about its industrial laundry facility in Ontario, California and their use of recycled water. The water is provided by Inland Empire Utilities Agency (IEUA) and meets California Title 22 standards for unrestricted use with full body contact (tertiary treatment with high-level disinfection). Their laundry process is completely automated from the washer to the dryer with front-loading washers that tilt forward to empty the wash onto a conveyor belt that then carries the linen to the dryers. During washing operations, there is no contact between workers and the recycled water or the damp washing material. Minimal retrofits were needed to accommodate the conversion of the facility to reclaimed water since the laundry process lines were already separate from the potable water lines. Cintas promotes their use of recycled water in discussions with large customers who inquire about their sustainability efforts.

The Florida Department of Corrections was contacted regarding its prison laundry facility (Case Study No. 6). The prison system laundries are manually loaded and unloaded similar to a public laundromat. All of the laundry generated within the prison is washed in cold water, except for the laundry generated from the medical area within the prison, which is washed in hot water. No retrofits were required within the laundry facilities to convert operation from potable to recycle water use. The facility has been in operation with recycled water for 10 years and has not experienced any issues related to recycled water use.

5.0 RELATIVE RISK OF POTABLE VERSUS RECYCLED WATER USE IN COMMERCIAL LAUNDRIES AND VEHICLE WASHING OPERATIONS

This section evaluates the potential risk for human exposure associated with the proposed new uses in more detail. The risk categorization uses a two-pronged approach. A literature review was conducted to summarize the findings of relevant existing studies on risk evaluations of recycled water uses similar to the ones proposed in this study. This literature review reports relevant study findings without bias to the study results. In addition, a sampling program was conducted to characterize the relative water quality differences between Denver Water recycled water (Category 3 water) and potable process water currently used and internally recycled at commercial laundry facilities and vehicle washing operations. The list of sampling parameters used in this study reflects the specific exposure pathways and agent groups of concern associated with the proposed uses.

There are hundreds of reuse systems across the United States, many of which have been in operation for decades. A careful review of the literature indicates that using recycled water under proper regulatory and operational practice is very safe in terms of public health. There is significant evidence supporting the safety of reclaimed water use. As noted in an extensive review of health risks data from spray irrigation in parks and golf courses, "*there have not been any confirmed cases of infectious disease that have been documented in the U.S. as having been caused by contact, ingestion, or inhalation of pathogenic microorganisms at any landscape irrigation site subject to reclaimed water criteria*" (pp. 6, Crook, 2005). For example, one California park has used recycled water for spray irrigation (treated to a significantly lesser standard than tertiary filtration and disinfection) for over 70 years with no reported negative impacts. An extensive survey of the literature on water reuse for irrigation of parks and golf courses led Crook (2005) to conclude that the general consensus is that tertiary treatment (secondary treatment plus filtration and disinfection) provides an adequate level of treatment for public health protection. Cumulatively, these projects have demonstrated that using properly treated reclaimed water with proper cross-connection controls and use requirements is protective of human health and the environment.

Additionally, studies of chemical hazards and risks from reclaimed water have found no negative impacts. The National Research Council (NRC), a highly respected scientific organization, published a report in 2012 titled, "Water Reuse: Potential for Expanding the Nation's Water Supply through Reuse of Municipal Wastewater." The NRC reviewed a range of chemical risk data and concluded, "*To date, epidemiological analyses of adverse health effects likely to be associated with use of reclaimed water have not identified any patterns from water reuse projects in the United States*" (pp. 108, NRC, 2012).

5.1 Risk Assessment

"Risk assessment" refers to an analytical tool used to characterize the expected incidence of adverse health effects associated with exposure to an environmental hazard (EPA, 2005). It can also be used to estimate the benefits associated with reducing a risk. Scientific data is collected and analyzed by the risk assessor to evaluate the frequency and

magnitude of human and/or ecological exposures from contact with a medium (inhalation, dermal contact, ingestion) and the associated risk. Risk is typically classified as either acute (e.g., pathogens in water that will immediately make you sick) or chronic (e.g., long-term exposure to a carcinogenic compound).

While risk assessment is a standardized process, execution is not. The accuracy and extent to which human health risk from exposure to a chemical or pathogen can be quantified is dependent upon the quantity and quality of risk and occurrence data available for a specific constituent. Human health research is not conducted in a uniform, contaminant-by-contaminant, standard way. Health data are not contained in one centralized database and not all chemicals and pathogens have been tested fully (or even partially). Water quality is not exhaustively tested everywhere for every contaminant of possible interest.

Risk studies on the exposure to pathogens typically take one of two main forms, epidemiological studies, or quantitative microbial risk assessments (QMRAs). Both types of studies have been reviewed as part of this study and are summarized below as relevant to the uses evaluated in this study.

Epidemiological studies are intended to show potential associations between certain "conditions" and adverse public health outcomes. They show that something is occurring (or has occurred), but they are not directly useable for predicting risks or changes in risks in other settings. QMRAs can be used, if data permit, to make predictions that have not been observed yet or because of the limitations in sensitivity of epidemiological studies cannot be observed even if they exist. Epidemiological studies look for a correlation between exposure to pathogens or toxic chemicals and illness. Generally, in these reuse studies medical data is collected on individuals exposed to some type of recycled water (and often an unexposed control group) and the data is then analyzed to look for a correlation between illness and exposure. QMRAs estimate the risk associated with exposure level(s) and dose-response data (toxicity as a function of dose). The goal is to identify pathogens of potential risk, pathways of infection (e.g., ingestion and inhalation), and to quantify the risk associated with exposure in dose-response relationships.

5.2 Literature Review on Risk Evaluations Relevant to Uses Evaluated in this Study

The central health concern with respect to industrial use of recycled water is waterborne disease transmission. In reclaimed water exposure, there are two main routes of exposure identified in the literature: ingestion of contaminated water via hand-to-mouth contact, or by inhalation of aerosolized water containing suspended pathogens (USEPA, 2012). The peer-reviewed, published research related to exposure risk from recycled water in non-potable reuse settings almost exclusively focuses on inhalation (typically estimated at 1 mL) and accidental ingestion (conservatively estimated at 100 mL in risk studies, including the EPA swim beach standards on which Colorado's Regulation 84 *E. coli* limits were based).

Various studied have looked specifically at the epidemiological effects of exposure to microbial agents present in recycled water or wastewater. Most of these studies focused on irrigation applications of reclaimed water and are thus only useful in part for a direct comparison with the risk of extended inhalation exposure associated with uses evaluated in

this study, particularly manual vehicle washing operations where the frequency of exposure may be higher. Some of the studies do not report details regarding water quality or exposure conditions to allow a direct comparison to the uses contemplated herein. However, they do address the use of recycled water in spray applications and are the most similar type of application with a significant body of data.

Studies of secondary effluent spray irrigation have generally found no significant health effect on individuals in its proximity. For example, an Israeli study compared the rate of enteric illnesses between 13 settlements that used secondary wastewater effluent for irrigation and those that used potable water (11 settlements) and found no significant difference in the incidence of disease between both applications (Shuval and Fattal, 1981). Another study concluded that extended proximity to a wastewater treatment plant (WWTP) did not result in a heightened immune response to *Legionella pneumophilia*, or enteric viruses (i.e., Norwalk virus, and Hepatitis A) (Noerthrop et al., 1981). In fact, this literature review identified two epidemiology studies that considered proximity to wastewater or reclaimed water and no associations were found with adverse health effects in any of those studies.

In a comprehensive review of six toxicological and epidemiological studies of a range of reuse system types, the NRC found no significant difference in patterns of adverse birth outcomes, mortality, morbidity and cancer rates and infectious disease between areas that used reclaimed water and those that did not (NRC, 1998). These studies included: 1) toxicological studies of reclaimed water from multiple large-scale projects (Montebello Forebay Project, Los Angeles County, California, the Denver Potable Water Reuse Demonstration Project in Denver, Colorado, the Tampa Water Resource Recovery Project in Tampa Bay, Florida, the Total Resource Recovery Project in San Diego, California, the Potomac Estuary Experimental Wastewater Treatment Plant in Potomac, Maryland and the direct potable reuse plant[1] in Windhoek, Namibia); and 2) two epidemiological studies on Windhoek, Namibia's direct potable reuse plant, a study on the Tampa Water Resource Recovery Project, and three studies on the Montebello Forebay Project – the longest of these studies spanned 30 years.

Another study, conducted in Colorado Springs, Colorado from 1984 to 1987, compared the impact of park irrigation with potable water, recycled water and irrigation with runoff on the incidence of gastrointestinal illness (Durand and Schwebach, 1989). The recycled water used was filtered and disinfected secondary effluent (fecal coliform densities in the reclaimed water samples never exceeded 11.9/100 mL and averaged 5/100 mL). While wet grass with exposure to elevated levels of bacterial indicators (>500/100 mL) were associated with a higher incidence of gastrointestinal illness, only the park runoff had levels exceeding this rate. The mean and maximum concentrations of fecal coliform in the runoff samples exceeded those in the reclaimed water and were >3,000/100 mL and >12,000/100 mL, respectively. The researchers concluded that "recycled water can be used for public park irrigation without undue hazard to health, provided that bacteria density levels are kept below those identified here" (pp. 1660, Durand and Schweback, 1989).

[1] WWTP effluent treated with sand filtration, GAC and chlorination, not the newer fully advanced treatment system upgrades currently in place.

According to NRC (2012), since this report, few additional epidemiological studies on the human health impacts of reclaimed water have been conducted. A review of the literature confirmed this fact. All of the (few) studies on health effects of reclaimed water with available full citations are included here.

Quantitative microbial risk assessments have primarily focused on assessing dose response relationships for illnesses brought as a result of exposure to filtered and disinfected wastewater effluent. Limited data are available on exposure to secondary effluent, which has been included for reference in this review as well. Although the findings of quantitative microbial risk assessments are somewhat anecdotal and the results specific to the selected study conditions (e.g., in terms of exposure routes and duration), a review of these studies provides supporting information for assessing the relative risk of reclaimed water uses evaluated in this study.

A review of the literature found that quantitative microbial risk assessments consistently found the gastrointestinal illness risk of exposure to secondary effluent to be very low (conservatively about 10^{-3} to 10^{-4}, or one in 1,000 to one in 10,000 per exposure), and the risk from exposure to tertiary effluent (i.e., secondary treatment with filtration and disinfection) was consistently calculated to be even lower (10^{-5} to 10^{-8}, or one in 100,000 to one in 100,000,000 per exposure). For reference, many EPA exposure assessments for chemicals and pathogens as well as California reuse water standards are based on an acceptable exposure risk ranging from 10^{-4} to 10^{-6}.

A study by Rose and Gerba (1991) estimated the illness risk from ingestion of 100 mL of secondary effluent to be on the order of 2×10^{-3} to 2×10^{-4}. Enhanced treatment of the secondary effluent by filtration and disinfection (similar to Regulation 84 Categories 2 or 3 reclaimed water standards) reduced the risk by about one order of magnitude to 2×10^{-4} to 2×10^{-6}. Another risk assessment by Rose, this time considering ingestion of 100 mL landscape irrigation water, had an associated risk estimate of 1×10^{-6} to 1×10^{-8} (Rose, 1996).

Tanaka, et al. (1993) sought to quantify the risk from exposure to enteric viruses by accidental ingestion of chlorinated secondary effluent and filtered chlorinated secondary effluent. The calculated annual risk for golfers who consumed 1 mL twice a week was less than 10^{-5}.

In a general survey of literature on the risk of exposure to irrigation with reclaimed water in parks, playgrounds, and schoolyards, Crook (2005) concluded that the health risk associated with the practice of spray irrigation is “immeasurably low” (pp. 18). The levels of microorganisms found in tertiary-treated water were far below their infectious doses (Enteric viruses: almost none, *Giardia*: 1 – 0.0005/L, *Cryptosporidium*: ~0.4 oocysts/L or less). In agreement with previous discussion as part of Section 3, Crook confirmed the general practice that aerosol minimization practices were only used where reclaimed water was not highly disinfected.

Olivieri (1997) evaluated the risks associated with exposure to a range of pathogens present in reclaimed water from industrial as well as recreational and municipal uses. The calculated risks from exposure to human viruses, *Cryptosporidium*, *Giardia,* and *E. coli* in

reclaimed water used for recreation and irrigation ranged from 10^{-4} to 10^{-8} with most uses at a risk of ~10^{-5}. Tanaka (1993) conducted a case study on vehicle washing in Marin, California and calculated the risk to be in the range of 10^{-5}.

A vehicle wash case study in Brazil evaluated the exposure risks to reclaimed water for both customers and workers (EPA, 2012). A risk analysis was performed employing dose-response models that used *E. coli* as an indicator of microbiological quality (Haas et al., 1999). Aerosol and ingestion exposure routes were estimated for one exposure per week for vehicle wash customers and 15 exposures per day for operators. This work concluded that there was no significant risk for users and an acceptable risk for operators (including aerosols) when *E. coli* concentrations are below 200 CFU/100 mL. Colorado regulations for Category 3 specify a single-sample maximum concentration of 126 CFU/100 mL, which is significantly below this value; Category 2 specifies a single-sample maximum of 235 CFU/100 mL.

Considering the risks of aerosol inhalation from untreated wastewater, Brown (1997) found that, "There is little data that indicates that [wastewater treatment plant] workers or nearby residents to a plant have actually become ill because of inhalation of pathogens in wastewater aerosols or from other wastewater/sludge contact, even though waterborne diseases are certainly transmitted via the contamination of drinking water with sewage."

The discussion in guidance documents and in the literature indicates that there is no significant concern with respect to dermal contact with reclaimed water. Of all the potential pathogens considered in this study, only *Mycobacteria* was identified as a potential dermal contact risk from water, primarily for immunocompromised populations (WHO 2011). Bodily contact was considered negligible compared to ingestion and inhalation for the proposed uses. If the risk from ingestion and inhalation is acceptably low, dermal contact, which has a comparatively small chance of being a significant vector as the route of infection would be exposure of a large enough open cut or cuts to allow a significant number of pathogens to enter the bloodstream; this vector is not expected to pose a significant risk. Notably, Colorado's reclaimed water *E. coli* criteria were based on EPA's swim beach standards, which allow full-body contact with water of similar quality.

In summary, there are a very limited number of studies that considered the risks of aerosol inhalation associated with reclaimed water for long-term workplace exposure. The available studies, both for worker and non-worker exposure, when considered together, have not identified negative health impacts associated with reclaimed water use for those exposed through ingestion or inhalation pathways. Even studies of inhalation associated with workers exposed to untreated wastewater aerosols were unable to draw links between that exposure and health implications.

5.3 Parameters of Concern

Table 9 presents a list of key water quality parameters that have been identified in this literature review to be of potential concern in recycled water applications, primarily for the potential human exposure routes analyzed in this study associated with the proposed uses (see Section 1). The emphasis in the risk assessment is primarily on microbial risk from aerosol inhalation, and less on ingestion, dermal contact, or environmental release because

of the relative likelihood of exposure for the proposed uses (see Sections 2 and 3). Some contaminant groups, such as trace organic compounds, have not been included in this list because of the limited potential exposure for ingestion of recycled water in commercial laundries and vehicle washes. Table 9 indicates the parameters that were included in the sampling program that was conducted in this study to characterize the Denver Water recycled water (Category 3 reclaimed water), as well as the current process water used at commercial laundries and vehicle washing operations. This analysis focused on Category 3 reclaimed water, in light of the proposed authorization of Category 3 water without requiring BMPs for aerosol inhalation prevention. As proposed for Regulation 84, uses of Category 2 reclaimed water would require BMPs to prevent frequent aerosol inhalation exposure.

Table 9 Parameters of Concern for Commercial Laundries and Vehicle Vehicle Wash Applications

Water Quality Parameters	Basis	Primary Human Health Concern	Sampled in This Study
Bacteria			
E. coli	Used in Regulation 84, enteropathogenic strains of concern	Ingestion	Yes
Total coliform	Broad fecal contaminant indicator	Ingestion	Yes
Fecal coliform	Broad fecal contaminant indicator	Ingestion	No (bacteria characterized with other parameters)
Legionella	Concern for regrowth	Inhalation, Ingestion	Yes
Heterotrophic Plate Count	Broad indication of general microbiological quality	NA	Yes
Enterococci	Used in Texas reuse regulations	Ingestion	No (bacteria characterized with other parameters)
Pseudomonas aeruginosa	Reported in literature as microbial indicator for inhalation	Inhalation	Yes
Mycobacterium (NTM)	Reported in literature as microbial indicator for inhalation	Inhalation, Dermal Contact	Yes
Amoeba	Can harbor other pathogens	Dermal Contact	Yes

Table 9 Parameters of Concern for Commercial Laundries and Vehicle Vehicle Wash Applications			
Water Quality Parameters	**Basis**	**Primary Human Health Concern**	**Sampled in This Study**
Protozoae			
Cryptosporidium	Resistant to chlorination Low infectious dose	Ingestion	Limited (not for all field samples due to analytical costs)
Giardia	Resistant to chlorination Low infectious dose	Ingestion	Limited (not for all field samples due to analytical costs)
Viruses			
Enteric viruses	Indicator for possible viral infection under direct lung contact	Inhalation, Ingestion	Yes
Other Microbial Indicators			
Microscopic Particulate Analysis (MPA)	Commonly used indicator of general microbial quality	NA	Yes
Physical Parameters			
Turbidity	Used in Regulation 84, indicator for filtration and disinfection effectiveness	Disinfection effectiveness	Yes
Electrical Conductivity	Less expensive substitute for TSS	NA	Yes
Organic Constituents			
Total Organic Carbon (TOC)	General water quality, indicator	NA	Yes
Other Water Quality Parameters			
Total Suspended Solids (TSS)	Used in Regulation 84, indicator for filtration and disinfection effectiveness	Disinfection effectiveness	No (disinfection effectiveness measured directly with target pathogens)
Total Dissolved Solids	Aesthetics (e.g., spotting on vehicles)	NA	No (focus in this study is on health risks)
Hardness	Aesthetics (e.g., spotting on vehicles, effectiveness of laundry detergents)	NA	No (focus in this study is on health risks)

5.4 Relative Water Quality Comparison of Recycled Water and Process Water

The following section describes the field sampling program conducted at several vehicle wash and laundry facilities in the Denver Water service area and presents the analytical results and conclusions. The goals of the sampling campaign conducted as part of this study were two-fold:

- Goal 1: Gather data on the presence of target microbial agents in these water samples to conduct a risk analysis for human exposure when converting vehicle wash and laundry operations to reclaimed water based on currently accepted and published dose-response relationships.
- Goal 2: Compare the water quality of the existing recycled process water used at vehicle wash and laundry facilities to Category 3 Reclaimed Water in terms of microbial indicators and other general water characteristics.

5.4.1 Field Sampling Program

As part of this study, process water samples from several vehicle wash and laundry operations in Denver Water's service area were sampled. Each of the facilities sampled is currently fed by Denver Water potable supplies, but could be candidates for future conversion to reclaimed water. Each facility sampled uses internal recycling of process water to increase its water use efficiency. The grab samples collected were from the internally recycled water systems. In the same sampling campaign, the Denver Water Recycle Plant final effluent was sampled from Denver Water's reclaimed water distribution system. All samples were collected by qualified Denver Water laboratory specialists and analyzed for the parameters indicated in Table 9 by Denver Water or other certified laboratories. Table 10 provides details on the specific sampling locations.

Table 10 Vehicle Wash and Laundry Sampling Locations(1)

Type of Facility	Sampling Location
Manual Vehicle Wash	The grab sample was collected from the automated nozzle rack supply piping outlet. The line was charged and then drained to a sample container several times to make up the necessary volume. The automated rack supply was the only supply that was accessible prior to chemical addition points and was representative of the water used in the manual washing process after all internal recycling and treatment operations were completed.
Automated Vehicle Wash	Grab sample collected from the discharge line of the pressure pump feeding the automated vehicle wash process. The sampling point was located downstream of the internal recycling process.(2)
Laundry Facility A	Grab sample collected from the pressure relief valve on the main supply line from the internal recycling tank to the washing process.

Table 10 Vehicle Wash and Laundry Sampling Locations[(1)]	
Type of Facility	**Sampling Location**
Laundry Facility B	Grab sample collected from the sampling tap on the discharge line of the internal recycling tank feeding the washing process.
Recycle Plant Final Effluent	Distribution system sample collected at Xcel Energy facility

Notes:

(1) Sampling was conducted on November 27, 2012 at all locations; samples were collected as grab samples.

(2) At the time of sampling it was noticed that wash water was continuously overflowing from the process system to the sanitary sewer despite the fact that no vehicle washing operation occurred for the duration of the sampling event. This indicated that the internal wash water recycling operation may not have been operating as intended during this sampling event.

5.4.2 Field Sampling Results

The results of the sampling campaign are summarized in Table 11.

None of the microbial pathogens included in the sampling program (i.e., *Cryptosporidium*, *Giardia, Legionella, Pseudomonas aeruginosa, Mycobacterium* (NTM), and enteric viruses) were detected in any of the field samples, including the sample from the reclaimed water distribution system. Historical results of MPA sampling conducted at the Denver Water Recycle Plant confirm that *Cryptosporidium* and *Giardia* have consistently been non-detect in the final effluent, data not shown here. Since microbial pathogens were absent from all samples collected, a quantification of risk due to exposure to Category 3 Reclaimed Water based on published dose/response relationships was not possible (Goal 1 of the sampling campaign, which was predicated on the assumption that there would be some measurable level of microbial agents present in the water).

The microbial indicators total coliform, *E. coli*, and amoeba were also non-detect in all samples, with the exception of the sample collected from the automated vehicle wash. This sample contained very low concentrations of total coliforms (2 MPN per 100 mL, see Table 11). Heterotrophic plate counts (HPC) were an order of magnitude lower in the sample collected from the reclaimed water distribution system compared to the samples collected at the laundries and the manual vehicle wash facility.

Other water quality parameters included in the analytical program also indicated that the Category 3 reclaimed water is of similar or better quality compared to the water currently internally recycled at commercial vehicle wash or laundry operations (i.e., conductivity, turbidity, and TOC).

The grab sample collected from the automated vehicle wash was generally of significantly better water quality compared to the sample collected from the manual vehicle wash or the laundry facilities based on HPC, conductivity, turbidity, and TOC concentrations. During the sampling event, it was observed that the internal water recycling storage tank was continuously overflowing to waste, indicating that the water in the recycle system may have

been continuously replenished with fresh potable water. Consistent with this observation, water quality at the automated vehicle wash facility was of generally higher quality than at the other facilities sampled.

Table 11 Results of Field Sampling for Commercial Laundries, Vehicle Wash Applications, and Recycle Plant Effluent (November 27, 2012)

Water Quality Parameter	Units	Finding
Bacteria		
Legionella	CFU/mL	ND in all samples (<0.001)
Total coliform	MPN/ 100 mL	ND in Recycle Plant effluent at Xcel (<1) ND in both laundries and manual vehicle wash (<1) 2 MPN/100 mL at automated vehicle wash
E. coli	MPN/ 100 mL	ND in all samples (Recycle Plant effluent at Xcel, laundries, and vehicle washes, <1)
Heterotrophic Plate Count	CFU/mL	Recycle Plant effluent at Xcel: 16 Manual vehicle wash: 120 Automated vehicle wash: 6 Laundries: >131
Pseudomonas aeruginosa	MPN/ 100 mL	ND in all samples (<1)
Mycobacterium (NTM)	CFU/mL	ND in all samples (<0.1 for all samples, except <10 for automated vehicle wash)
Amoeba		ND in all samples
Protozoae[(1)]		
Cryptosporidium	Counts/L	ND in finished water samples from Recycle Plant in 2011 and 2012
Giardia	Counts/L	ND in finished water samples from Recycle Plant in 2011 and 2012
Viruses		
Enteric viruses (incl. Adenovirus, Astrovirus, Rotavirus, Enterovirus)	Counts in 2.02 L	ND in all samples.

Table 11 Results of Field Sampling for Commercial Laundries, Vehicle Wash Applications, and Recycle Plant Effluent (November 27, 2012)		
Water Quality Parameter	**Units**	**Finding**
Other Microbial Indicators		
Microscopic Particulate Analysis (MPA)	counts/L	ND for all indicators in all samples with exceptions as follows: Recycle Plant effluent at Xcel: 200,000/L algae (chlorella), 7/L diatoms, 5/L rotifers, 5/L nematodes, 2/L ciliates, 7/L colorless flagellates. Manual vehicle wash: 1/L rotifers, 4/L pollen One of two laundries: 300/L pollen
Physical Parameters		
Turbidity	NTU	Recycle Plant effluent at Xcel: 0.15 Manual vehicle wash: 120 Automated vehicle wash: 0.23 Laundries: 24-30
Electrical Conductivity	uS/cm	Recycle Pant effluent at Xcel: 960 Manual vehicle wash: 3,100 Automated vehicle wash: 290 Laundries: 450-1,400
Organic Constituents		
Total Organic Carbon	mg/L	Recycle Pant effluent at Xcel: 6.5 Manual vehicle wash: 91.2 Automated vehicle wash: 1.3 Laundries: 60.5-93.6
Notes: ND: Non-detect (1) Due to the significant costs of the analysis, *Cryptosporidium* and *Giardia* were only quantified in the water sample collected in the reclaimed water distribution system, but not in the samples collected from the vehicle wash and laundry operations.		

5.4.3 Field Sampling Findings

Category 3 reclaimed water from the Denver Water distribution system was free of microbial pathogens, including bacteria, protozoae, and enteric viruses. This indicates that the use of Category 3 reclaimed water is appropriate for use in manual and automatic vehicle wash and laundry operations without restrictions or additional BMPs. The general water quality of the Category 3 reclaimed water sample was significantly better than the typical water quality of the internally recycled process water at vehicle wash and laundry facilities. Microbial pathogens were also not detected in any of the field samples collected at the vehicle wash or laundry facilities. It is therefore anticipated that a conversion from

potable supplies to reclaimed water in the future would not result in a degradation of microbial water quality.

The field sampling did not include Category 2 reclaimed water. It is thus not possible to draw conclusions on the level of risk due to exposure to reclaimed water undergoing lower disinfection requirements than Category 3 reclaimed water for commercial uses investigated in this study.

6.0 CONCLUSIONS

The evaluation of human health and environmental protection in this study drew upon the following sources of information relevant to commercial laundry, automated vehicle washing, and manual non-public vehicle washing uses of recycled water:

- Observations of water use in representative laundry and vehicle washing facilities;
- EPA 2012 Guidelines for Water Reuse;
- Other states' regulations and guidelines for similar uses;
- Comparison of the risks associated with the proposed uses to those of previously-approved reclaimed water uses under Colorado's Regulation 84;
- Previous studies assessing risks of reclaimed water use; and
- Comparison of recycled water quality to existing internally-recycled process water at representative facilities.

Together, these sources supported an overall conclusion that:

- Ingestion, dermal contact, cross-connections, and environmental exposure to reclaimed water are unlikely to occur in commercial laundries and vehicle washing facilities, and can be further mitigated through conditions of use specified in Regulation 84.
- There is the potential for frequent inhalation of aerosols at vehicle washing facilities.
- Aerosol inhalation presents human health risks for recycled water that is not highly disinfected.
- Aerosol inhalation risks can be mitigated through use of highly-disinfected reclaimed water (i.e., Category 3 reclaimed water), or through use of Category 2 reclaimed water in conjunction with conditions of use that prevent frequent exposure of workers and the public to aerosols.

Table 12 summarizes the proposed reclaimed water category and conditions of use for each proposed use for protection of human health, the environment, and prevention of cross-connections.

Table 12 Regulation 84 Reclaimed Water Categories and Conditions of Use for Proposed Uses			
Use	**Category 1 Water Quality**	**Category 2 Water Quality**	**Category 3 Water Quality**
Commercial Laundries	Not Allowed	Allowed(1,2)	Allowed(1)
Automatic Vehicle Washing	Not Allowed	Allowed(1,2,3)	Allowed(1,3)
Manual Non-Public Vehicle Washing	Not Allowed	Allowed(1,2,3)	Allowed(1,3)

Notes:

(1) The following additional conditions apply:
- Restrictions on area of use (84.9(C)(1), 84.9(C)(2), and 84.9(C)(9)).
- Notification, signage, markings, and worker education (84.9(C)(3) and 84.9(C)(4)).
- Cross-connection controls (84.9(C)(5), 84.9(C)(7), and 84.9(C)(8)).

(2) The following additional conditions apply:
- Where there is the reasonable potential for worker or public exposure to aerosols generated in the use, Users of Category 1 Reclaimed Water (if allowed for the use per Table A) or Category 2 Reclaimed Water shall employ measures to prevent the frequent exposure of workers and the public to aerosols generated in the use of reclaimed water. Measures shall include at least one of the following: minimum setback distance of 100 feet between the nearest source of aerosol generation and areas where workers or the public are normally present; physical barriers between aerosol sources and humans; personal protective equipment to prevent aerosol inhalation; functionally equivalent measures approved by a qualified individual (e.g., a certified industrial hygienist); or other means approved by the Division. Given the higher level of treatment provided for Category 3 Reclaimed Water, additional measures to address exposure of workers or the public to aerosols are not required. (Proposed 84.8(A)(7).)

(3) The following additional conditions apply:
- Application rates or other measures shall be employed to minimize ponding on or runoff from the area approved for application or use (Proposed 84.8(A)(3)).

7.0 REFERENCES

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Appendix A

PROPOSED STATEMENT OF BASIS AND PURPOSE LANGUAGE FOR REGULATION 84

84.25 STATEMENT OF BASIS, SPECIFIC STATUTORY AUTHORITY, AND PURPOSE (May, 2013 Hearing)

The provisions of sections 25-8-205(1) and 25-8-308(1)(h) C.R.S. provide the specific statutory authority for adoption of amendments to this regulation. The Commission also adopted, in compliance with section 24-4-203(4), C.R.S., the following statement of basis and purpose.

Basis and Purpose:

The use of reclaimed water has significantly increased in Colorado over the past decade and Treaters and potential Users of reclaimed water have identified an interest in new uses for reclaimed water that are not currently authorized under Regulation No. 84. Proponents from the Joint Water Reuse Committee of the Rocky Mountain Section American Water Works Association and Rocky Mountain Water Environment Association ("RMSAWWA/RMWEA") and the Colorado Section of the WateReuse Association, participating in a Water Quality Forum Work Group, requested that the Commission review Regulation No. 84 for the purpose of considering additional uses of reclaimed water.

As the Commission indicated in its initial adoption of Regulation No. 84, the use of reclaimed water is subject to Colorado water rights law. Several large municipalities have the right to use a portion of their water supply "to extinction" under Colorado law and have significant amounts of such water that are currently being discharged from the wastewater treatment facility rather than being further treated and reused.

In the 2010 triennial review for Regulation No. 84, the Commission discussed ideas that the Division and interested parties had brought forth for adopting new uses including modifying the regulation to establish broader categories of uses within which the Division could approve new uses. The Commission understands that the Division would need additional resources to implement such a scheme. However, in the interest of addressing the growing use of reclaimed water in Colorado in a timely manner, the Commission approved the renaming and addition of several specific new uses through these modifications to Regulation No. 84.

The Commission found that the following modifications to the nomenclature for authorized uses in Section 84.8 Table A are consistent with the intent of the original authorization of these uses, and presents no increase in the potential risk to human health or the environment. By modifying the nomenclature and clarifying the definition of these approved uses, similar industrial and commercial uses with similar human exposure, environmental release potential, and cross-connection potentials will be afforded the same protections under Regulation 84 and the individual Notices of Authorization issued by the Division.

- "Cooling Tower" was renamed "Evaporative Industrial Processes"
- "Closed Loop Cooling System" was renamed "Non-Evaporative Industrial Processes"
- "Dust Control", "Soil Compaction", and "Mechanized Street Cleaning" were combined and renamed "Non-Discharging Construction and Road Maintenance"
- "Concrete Mixing and Washout" was divided into two uses, "Non-Evaporative Industrial Processes" and "Washwater Applications," respectively

The Commission found that adding several new uses, with appropriate conditions placed on their use, will further facilitate the safe and efficient use of Colorado's limited water resources. The Commission approved the addition of the following Commercial Uses: Commercial Laundries, Automated Vehicle Washing, and Manual Non-Public Vehicle Washing, and a new Agricultural Irrigation use.

Evaporative Industrial Processes

The Evaporative Industrial Processes use includes, but is not limited to, the following representative applications where water is used in an industrial process where the benefit of such use requires the evaporation of water, requiring additional make-up water: cooling tower use and gas and odor adsorption. In modifying the nomenclature for this category so that it now covers multiple evaporative industrial process uses, the Commission recognized that many evaporative industrial processes have the potential to use reclaimed water instead of potable or other water supplies, with similar low potential for human exposure, releases to the environment, and cross connections. It is the Commission's intent that no discharges to waters of the state shall be allowed with this use unless authorized via an approved permit under the Colorado Discharge Permit System (CDPS).

Non-Evaporative Industrial Processes

The Non-Evaporative Industrial Processes use includes, but is not limited to, the following representative applications where water is used in an industrial process, is not evaporated in the process, is used within a contained system, and is either discharged to a sewer system as a blow down (e.g., closed loop cooling systems) or is incorporated into a product that is not intended for personal contact or ingestion (e.g., those in which the water is retained in the product and conditions prevent excessive microorganism growth, such as the high pH of batched concrete): closed loop cooling systems (a previously-approved use, Sections 84.8 and 84.22), concrete makeup water (a previously-approved use as concrete mixing and washout, Sections 84.8 and 84.22), boiler feed water, water for lime slaking, and industrial process makeup water. In modifying the nomenclature for this category so that it now covers multiple non-evaporative industrial process uses, the Commission recognized that many industrial processes have the potential to use reclaimed water instead of potable or other water supplies, with similar low potential for human exposure, releases to the environment, and cross connections. It is the Commission's intent that no discharges to waters of the state shall be allowed with this use unless authorized via an approved permit under the CDPS.

Non-Discharging Construction and Road Maintenance

This approved use incorporates the following previously-approved representative uses for Mechanized Street Sweeping, Soil Compaction, and Dust Control. Other similar uses of water, including but not limited to cooling water for pavement cutting operations, are also authorized under this approved use. It is the Commission's intent that no discharges to waters of the state shall be allowed with this use unless authorized via an approved permit under the CDPS.

Washwater Applications

The Commission approved the new Washwater Applications use, which includes concrete washout as previously approved under Concrete Mixing and Washout. Washwater Applications would also include water used in washing of miscellaneous equipment, washing of product in mineral processing, and other similar uses where reclaimed water is used to remove material from equipment or a product. This use has been evaluated for risks to human health via ingestion, inhalation, and dermal contact. Best management practices (BMPs, specified as Additional Conditions in Section 84.8 and 84.9) and allowable water qualities are specified to mitigate these risks. It is the Commission's intent that no discharges to waters of the state shall be allowed with this use unless authorized via an approved permit under the CDPS.

Commercial Laundries, Automated Vehicle Washing, and Manual Non-Public Vehicle Washing

The Commission approved three new uses not previously authorized under Regulation 84 (Commercial Laundries, Automated Vehicle Washing, and Manual Non-Public Vehicle Washing) based upon an evaluation of the potential human health risks via ingestion, inhalation, dermal contact and cross-connection as well as the potential for discharging reclaimed water to a water of the state (groundwater

or surface water). BMPs for each use and allowable water qualities were specified to minimize these risks. In assessing the proposed modifications to Regulation 84, typical uses of water in commercial laundries and automated and manual vehicle washing facilities were reviewed to characterize the likelihood and impacts of human contact with reclaimed water and releases of reclaimed water to waters of the state.

The Commission found that the potential for ingestion is negligible for all three proposed uses, in light of the limited access to the public and the commercial and industrial nature of the water use. The risk of ingestion in these new uses is further mitigated by the BMPs specified for these uses in Regulation 84. In light of the potential worker or public contact with aerosols in vehicle washing applications, the Commission considered additional information to assess the potential for human health effects of such contact. This information included the 2012 USEPA Guidelines for Water Reuse, regulations in other states that authorize commercial laundry and vehicle washing uses, a risk assessment based on available research and literature regarding health impacts of inhalation of recycled water aerosols, and a comparison of water quality in internally-recycled vehicle washing water systems fed by potable water to the water quality of recycled water produced by an existing Treater. This indicated to the Commission that a high level of disinfection is appropriate for situations where there is a high likelihood of frequent worker contact with reclaimed water aerosols. Alternatively, BMPs should be employed to prevent frequent worker inhalation exposure if less stringent disinfection is employed.

The Commission found that:

- Secondary treatment and disinfection (Category 2 Reclaimed Water) is an appropriate treatment requirement for the use of reclaimed water in commercial laundry and vehicle washing facilities where there is no frequent worker or public exposure to aerosols generated from reclaimed water use.
- In facilities with a high likelihood of frequent worker or public exposure to aerosols generated from reclaimed water use, filtration and high-level disinfection (Category 3 Reclaimed Water) provides human health protection against aerosol inhalation risks. Alternatively, BMPs must be used to prevent the frequent inhalation of aerosols with use of Reclaimed Water Category 2.
- Effective BMPs for physically preventing frequent human contact with aerosols may include 100-foot setback distances (similar to the irrigation setback from water supply wells specified under Section 84.9(C)(9), and consistent with other states' requirements for protection of food preparation or consumption areas), physical barriers such as curtains or other means of containing aerosols to the area of generation, personal protective equipment to prevent inhalation of aerosols, or other means as may be appropriate to the site and use.

Accordingly, the Commission approved the addition of the new Additional Condition at Section 84.8(A)(7). The Commission determined that this Additional Condition is applicable to the following renamed and new uses, in consideration of the type of use and potential for frequent worker or public exposure to aerosols: Washwater Applications, Non-Discharging Construction and Road Maintenance, Non-Evaporative Industrial Processes, Commercial Laundries, Automated Vehicle Washing, and Manual Non-Public Vehicle Washing.

The Commission found the overall risk to Commercial Laundry and Vehicle Washing workers and the public associated with ingestion and dermal contact is less than swimming at a swim beach and comparable to or less than other previously approved commercial and industrial uses of Category 1, 2, and 3 Reclaimed Water. For each of these proposed uses, the Commission found the potential for cross-connecting potable and recycled water piping is similar to previously approved Commercial and Industrial uses of Category 1, 2, and 3 Reclaimed Water. The existing BMPs for cross-connection control in Regulation 84 (at 84.9(C)(5), 84.9(C)(7), and 84.9(C)(8)) will apply to these new uses as well.

The Commission approved the modification of Section 84.8(A)(3) to read "Application rates or other measures shall be employed to minimize ponding on or runoff from the area approved for application or use," and specified that this Additional Condition be required for Automated Vehicle Washing and

Manual Non-Public Vehicle Washing uses. It is the Commission's intent that no discharges to waters of the state shall be allowed with these uses unless authorized via an approved permit under the CDPS.

Non-Food Crop Irrigation and Silviculture

The Commission found that the use of reclaimed water for irrigation of certain agricultural crops and trees, when implemented in accordance with the reclaimed water quality standards and BMPs established in Regulation 84, is protective of public health and the environment. Adding agricultural irrigation as an approved use of reclaimed water will encourage the expanded use of reclaimed water in Colorado and is anticipated to reduce the regulatory compliance burden on Treaters and Users by allowing them to be permitted under a single control regulation where multiple approved uses of reclaimed water are implemented.

Health risks to the public or workers associated with potential contact with reclaimed water used for agricultural irrigation were determined to be of a comparable or lower magnitude than those associated with landscape irrigation. Environmental risks associated with runoff or excessive percolation of reclaimed water to waters of the state are determined to be of a comparable or lower magnitude than those risks associated with landscape irrigation. The Commission found that there is little increased risk of cross connection associated with the use of reclaimed water versus traditional sources of water used for agricultural irrigation.

The Commission found that Category 1 water is acceptable for irrigation of those non-food crops permitted to be irrigated with reclaimed water pursuant to this Control Regulation and that the criteria for Category 1 water are generally consistent with the treatment level requirements and water quality standards adopted by several other states (e.g., Arizona, California, Florida, and Texas) and countries for the irrigation of non-food crops. The Commission found that the BMPs established for restricted access landscape irrigation are appropriate and adequate for agricultural irrigation.

Annual Report Requirements

As part of this rulemaking, the Commission also revised the annual reporting provision to revise the due date of annual reports from January 31 of each year to March 31, to allow Treaters sufficient opportunity to compile reclaimed water use data and related records from the preceding calendar year.

Appendix B

CASE STUDY DOCUMENTATION – USERS OF RECLAIMED WATER IN VEHICLE WASHING AND COMMERCIAL LAUNDRY OPERATIONS

Case Study No: 1 **Use type:** Vehicle washing (buses) **Date Contacted:** September 2012

Use Name: Walt Disney World Bus Washing Facility

Location: Lake Buena Vista, FL
Reclaimed water provider: Reedy Creek Improvement District

Contact name: Mr. Ted McKim **Phone No:** 407-824-4846 **EMail:** Ted.McKim@Disney.com

Year started using reclaimed water: first used in 1971; major conversion in 1993 ; bus wash in service since 1996

Describe process/facilities (public access, employee contact, storage tanks, use volume per cycle, etc):
1) Automated, unmanned facility, w/ limited public access. Bus drivers stay in buses during the wash process
2) Staff do NOT restock chemicals or perform maintenance when units are operating
3) The bus fleet is washed every day. Wash 319+ buses w RW, final rinse is potable water
4) No drift control features – building is roof structure w open sides.
5) The workers do NOT wear any protective gear.
6) Floor drains from the wash water flow to the sanitary sewer. Roof drains flow to a stormwater retention basin. Exterior asphalt is sloped away from the building, like any other commercial building.

Facility retrofits required to comply with regulations and reclaimed water provider:
1) Initial concern w/ aerosol drift, but since facility is automated/unmanned was not applicable
2) Final rinse with potable water to allay fears and to dispel concern over impacts to paint and finishes, and also to reduce water spots

Regular monitoring and inspection requirements or needs:
1) Monitor for fecal (typically non-detect results) at the WWTP effluent on a daily basis
2) Monitor for crypo and giardia (typically below action levels) at the WWTP effluent bi-annually
3) Annual Effluent Analysis Report – about 40 constituents for the WWTP Effluent

Additional requirements needed for service (i.e.: not needed for regs, but are needed for service requirements such as added potable rinse, cut back on chemicals/soaps, etc):
1) Final rinse uses potable water – main concern was finishes and paints on bus bodies, and to reduce water spots
2) Reclaimed water TDS is 400+ mg/L, while the potable is about 1/2 that, so spotting was a concern

Other items to consider/issues/concerns:
1) Feels little to no concern of disease transmission due to reclaimed water
2) No cases of reported illness from exposure to reclaimed water (16 yrs in operation)
3) This is a relatively high quality reclaimed water and typically meets or exceeds the primary and secondary drinking water standards. It has very low nutrient levels (T-N at about 1mg/l and T-P at 0.1mg/l), and the turbidity levels are typically less than 1 NTU.

Case Study No: 2 **Use type:** Vehicle washing (all vehicles)

Date Contacted: September 2012

Use Name: Bett's Car Wash (at Chevron Gas Station w/ mini mart)

Location: 170 Merrydale Rd, San Rafael, CA

Reclaimed water provider: Marin Municipal Water District (MMWD)

Contact name: Charles (manager/owner) **Phone No:** 415-472-5160 **EMail:** N/A

Year started using reclaimed water: 1989/90 (over 20 years)

Describe process/facilities (public access, employee contact, storage tanks, use volume per cycle, etc):

1) Step 1 - Employees hand rinse car using recycled water (from MMWD) – flows to sump then reclaimed pit
2) Step 2 - Employees hand wash car using mitts, soap, recycled water – flows to sump then reclaimed pit
3) Step 3 – Car goes into a 2nd wash stage by a machine in a tunnel – water used is reclaimed water from the pit
4) Step 4 – At end of the wash tunnel, employees hand rinse car using recycled water
5) Step 5 – Car goes into blow-dryer tunnel
6) Step 6 – Car is towel dried by employees
7) Employees wear gloves since their hands are in water constantly, but they are NOT required or mandatory.
8)There is no aerosol containment, NOT needed due to high quality of water.
9)The areas both inside the tunnel and outside the tunnel are sloped to the sump. Outside the tunnel also collects rainwater.

Facility retrofits required to comply with regulations and reclaimed water provider:

1) None done by Bett's

Regular monitoring and inspection requirements or needs:

1) The reclaimed water pits flow back to the sewer continually.
2) About every 1 – 1.5 years, the reclaimed pits are pumped out to remove the solids built up.

Additional requirements needed for service (i.e.: not needed for regs, but are needed for service requirements such as added potable rinse, cut back on chemicals/soaps, etc):

1) MMWD initially installed an RO unit to help with possible spotting. No spotting occurred and it was removed after about 6-7 years as it was not considered useful.

Other items to consider/issues/concerns:

1) The chemicals used by Bett's are the same as were used before recycled water use – chemicals from Ecolab.

Case Study No: 3 **Use type:** Industrial laundry facility **Date Contacted:** October 2012

Details not included, as facility is not yet in operation.

Case Study No: 4 **Use type:** Industrial laundry facility **Date Contacted:** October 2012

Use Name: CINTAS Corporation **Location:** Ontario CA

Reclaimed water provider: Inland Empire Utilities Agency (IEUA)

Contact name: Mr. Scott Kennedy **EMail:** KennedyR@cintas.com

Phone No: 760-941-8422 (office) 760-485-1452 (cell)

Year started using reclaimed water: 2009 (at least 2-3 years in use)

Describe process/facilities (public access, employee contact, storage tanks, use volume per cycle, etc):
1) Automated facility from washer to dryer – front loading washers spin out laundry, then tilt about 45 degree forward and dump onto a conveyor belt that then moves to dryer and dumps in.
2) Use about 120,000 gpd and discharge back to IEUA about 100,000 gpd (~20% evaporation loss)
3) No contact other than leaks (when occur) and process mishaps (contact is with damp laundry, not wet).
4) Avg wash temp is 150 degree, cold wash/flush is at 100 degree temps.
5) Use bleach regularly as well.

Facility retrofits required to comply with regulations and reclaimed water provider:
1) Recycled water is used at laundry, boilers, and for irrigation
2) Laundry process is completely separate from potable uses so retrofits were relatively easy.
3) Label recycled water pipes, tanks, etc – or color purple

Regular monitoring and inspection requirements or needs:
1) Send supervisors and maintenance staff to training, then supers train regular employees
2) Every 4 years cross connection test, and yearly overspray test (for irrigation areas)
3) IEUA completed the Engineer's Report that was required by CDPH –which was a huge help to Cintas.

Additional requirements needed for service (i.e.: not needed for regs, but are needed for service requirements such as added potable rinse, cut back on chemicals/soaps, etc):
1) None – thought could be an issue but has operated successfully since it started.

Other items to consider/issues/concerns:
1) As of Feb 9, 2012, switching all facilities to an environmentally friendly, biodegradable product (Washing Systems' Structure) free of phosphates and ethelyne diamine tetra-acetic acid (EDTA)
2) 1st company in industrial laundry business to transition to detergents free of nonylphenol ethoxylates (NPE) (2010 – EPA issued action plan to eliminate NPE use)
3) Recycled water use showed a payback of 2 years! Cost for recycled water is 50% less than potable. Water is their smallest utility cost, but when you add in the cost savings on both the supply and discharge side it was substantial. Cost effectiveness was not based on water alone – saved about $4k/mos on water bill and about $10k/quarter on sewer discharge charges.
4) Cintas does discuss their use of recycled water w larger customers so they can know about their sustainability in the industry.

Case Study No: 5 **Use type:** Car Washes **Date Contacted:** November 2012

Describe process/facilities (public access, employee contact, storage tanks, use volume per cycle, etc):
1) Automated with hand drying at the end of the processes

Use Name: none specific

Location: Altamonte Springs, FL

Reclaimed water provider: Altamonte Springs Utilities

Contact name: Mr. Scott Causseaux **EMail:** SFCausseaux@altamonte.org

Phone No: 407-571-8663

Year started using reclaimed water:

Facility retrofits required to comply with regulations and reclaimed water provider:
1) the only stipulations were proper signage and backflow preventers on both potable and reclaimed

Regular monitoring and inspection requirements or needs:
N/A.

Additional requirements needed for service (i.e.: not needed for regs, but are needed for service requirements such as added potable rinse, cut back on chemicals/soaps, etc):
N/A.

Other items to consider/issues/concerns:
N/A.

Case Study No: 6 **Use type:** Industrial laundry facilities (at prisons)

Date Contacted: November 2012

Describe process/facilities (public access, employee contact, storage tanks, use volume per cycle, etc):
1) Manual load-unload process (like Laundromat) - done by prisoners
2) Everything washed in cold water, except medical laundry is washed in hot

Use Name: Columbia Correctional Institution and Martin Correction Institution (plus 2-3 other Dept of Corrections are using and/or capable to use)

Location: Columbia (Northern FL – 50 mi S of Georgia) and Martin (Southern FL – about 150 mi N of Miami)

Reclaimed water provider: Prison WWTPs

Contact name: Mr. Bailey Barefoot **EMail:** Barefoot.Bailey@mail.dc.state.fl.us
Phone No: 850-717-3925

Year started using reclaimed water: ~ 2002 (10 years or so)

Facility retrofits required to comply with regulations and reclaimed water provider:
1) upgrade WWTP process to full body contact reuse
2) nothing changed at prison laundry

Regular monitoring and inspection requirements or needs:
1) standard for FDEP full body contact requirements at the WWTP

Additional requirements needed for service (i.e.: not needed for regs, but are needed for service requirements such as added potable rinse, cut back on chemicals/soaps, etc):
1) None

Other items to consider/issues/concerns:
1) Were able to reduce purchased potable and/or groundwater pumping by about 100,000 gpd.

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